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Effective 1 January 1988

FIELD MANUAL

No. 6-300

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 15 May 1987**ARMY EPHEMERIS 1988-1992**

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PREFACE

This manual is a compilation of tables and charts which are used in field computations of astronomical observations by the field artillery. These tables and charts are compiled and provided by the Nautical Almanac Office; US Naval Observatory; H. M. Nautical Almanac Office, Royal Greenwich Observatory; and National Oceanic Atmospheric Administration.

This manual reflects the update of data to encompass the years 1988 through 1992. It is designed to be used in conjunction with FM 6-2, Field Artillery Survey.

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CHAPTER 1

INTRODUCTION

1-1. PURPOSE AND SCOPE

a. This manual is a compilation of tables and charts for use in computing astronomical azimuths for the field artillery. These tables and charts are used for computing azimuth of the Sun or selected stars by either the altitude or the hour-angle method. Special tables (tables 12 through 12e), which are tabular methods of computing Polaris, are included for a rapid computation of a Polaris azimuth. The secant tables accompanying these tables are permanent. Tables and charts are also included to correct astronomic azimuth to grid azimuth, to extend azimuth by simultaneous observation, and to perform zone-to-zone transformation of azimuth.

b. Data contained in tables 2a, 2b, 2c, 2d, 2e, 10a(1), 10a(2), 10a(3), 10a(4), 10a(5), 10b(1), 10b(2), 10b(3), 10b(4), 10b(5), 11a, 11b, 11c, 11d, 11e, 12a, 12b, 12c, 12d, and 12e are current only for the years in which the manual is effective.

1-2. DESCRIPTION OF TABLES AND CHARTS

This manual is intended to be used as a companion publication to FM 6-2, *Field Artillery Survey*. Details on the computation of astronomical azimuth and the use of these tables and charts are contained in FM 6-2.



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CHAPTER 2

ASTRONOMICAL TABLES AND CHARTS

Table 1a. Astronomic Refraction Corrected for Temperature (Degrees)

TO BE SUBTRACTED FROM OBSERVED ALTITUDE OF SUN OR STAR

(Use values of observed altitude and temperature nearest the values tabulated as arguments.)

Observed altitude	Temperature °F.																
	-30	-20	-10	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100	+110	+120	+130
00 00	40-43	39-45	38-53	38-02	37-15	36-27	35-44	35-01	34-20	33-40	33-01	32-26	31-51	31-36	30-43	30-14	29-46
20	35-57	35-06	34-20	33-35	32-53	32-11	31-33	30-55	30-18	29-44	29-09	28-38	28-07	27-37	27-07	26-42	26-17
40	32-00	31-15	30-34	29-54	29-16	28-39	28-05	27-31	26-59	26-28	25-57	25-30	25-02	24-35	24-09	23-46	23-23
01 00	28-42	28-01	27-25	26-49	26-15	25-42	25-12	24-41	24-12	23-44	23-17	22-52	22-27	22-03	21-40	21-19	20-59
20	25-55	25-19	24-46	24-13	23-43	23-13	22-45	22-18	21-51	21-26	21-02	20-39	20-17	19-55	19-44	19-15	18-57
40	23-34	23-00	22-31	22-01	21-33	21-06	20-41	20-16	19-52	19-29	19-07	18-46	18-26	18-06	17-47	17-30	17-13
02 00	21-32	21-02	20-35	20-07	19-42	19-17	18-54	18-31	18-10	17-49	17-28	17-10	16-51	16-33	16-15	16-00	15-45
20	19-48	19-20	18-54	18-29	18-06	17-43	17-22	17-01	16-41	16-22	16-03	15-46	15-29	15-12	14-56	14-42	14-28
40	18-17	17-51	17-28	17-05	16-43	16-22	16-03	15-43	15-25	15-07	14-50	14-34	14-18	14-02	13-48	13-35	13-22
03 00	16-57	16-33	16-12	15-50	15-30	15-11	14-53	14-35	14-18	14-01	13-45	13-30	13-16	13-01	12-48	12-36	12-24
20	15-47	15-25	15-05	14-45	14-27	14-08	13-51	13-35	13-19	13-04	12-48	12-35	12-21	12-08	11-55	11-44	11-32
40	14-45	14-25	14-06	13-47	13-30	13-13	12-57	12-42	12-27	12-12	11-58	11-46	11-33	11-20	11-08	10-58	10-47
04 00	13-50	13-31	13-13	12-56	12-40	12-24	12-09	11-54	11-40	11-27	11-14	11-02	10-50	10-38	10-27	10-17	10-07
20	13-01	12-43	12-26	12-10	11-55	11-40	11-26	11-12	10-59	10-46	10-34	10-23	10-11	10-00	09-50	09-40	09-31
40	12-17	12-00	11-44	11-29	11-14	11-00	10-47	10-34	10-22	10-10	09-58	09-47	09-37	09-26	09-16	09-08	08-59
05 00	11-38	11-21	11-07	10-52	10-38	10-25	10-13	10-00	09-48	09-37	09-26	09-16	09-06	08-56	08-47	08-38	08-30
20	11-02	10-46	10-32	10-18	10-05	09-53	09-41	09-29	09-18	09-07	08-57	08-47	08-38	08-28	08-19	08-12	08-04
40	10-29	10-14	10-01	09-48	09-35	09-23	09-12	09-01	08-50	08-40	08-30	08-21	08-12	08-03	07-55	07-47	07-40
06 00	09-59	09-45	09-32	09-20	09-08	08-56	08-46	08-35	08-25	08-16	08-06	07-57	07-49	07-40	07-32	07-25	07-18
20	09-32	09-18	09-06	08-54	08-43	08-32	08-22	08-12	08-02	07-53	07-44	07-35	07-27	07-19	07-11	07-05	06-58
40	09-07	08-54	08-42	08-31	08-20	08-09	08-00	07-50	07-41	07-32	07-23	07-16	07-08	07-00	06-53	06-46	06-40
07 00	08-43	08-31	08-20	08-09	07-59	07-49	07-39	07-30	07-21	07-13	07-05	06-57	06-50	06-42	06-35	06-29	06-23
20	08-22	08-10	08-00	07-49	07-39	07-30	07-21	07-12	07-03	06-55	06-47	06-40	06-33	06-26	06-19	06-13	06-07
40	08-02	07-51	07-41	07-31	07-21	07-12	07-03	06-55	06-47	06-39	06-31	06-24	06-17	06-10	06-04	05-58	05-53
08 00	07-44	07-33	07-23	07-13	07-04	06-55	06-47	06-39	06-31	06-24	06-16	06-10	06-03	05-56	05-50	05-45	05-39
20	07-27	07-16	07-07	06-57	06-49	06-40	06-32	06-24	06-17	06-09	06-02	05-56	05-49	05-43	05-37	05-32	05-27
40	07-11	07-01	06-52	06-42	06-34	06-26	06-18	06-10	06-03	05-56	05-49	05-43	05-37	05-31	05-25	05-20	05-15
09 00	06-56	06-46	06-37	06-28	06-20	06-12	06-05	05-58	05-51	05-44	05-37	05-31	05-25	05-19	05-14	05-09	05-04
20	06-42	06-32	06-24	06-15	06-08	06-00	05-53	05-46	05-39	05-32	05-26	05-20	05-14	05-08	05-03	04-58	04-54
40	06-29	06-19	06-11	06-03	05-56	05-48	05-41	05-34	05-28	05-21	05-15	05-10	05-04	04-59	04-53	04-49	04-44
10 00	06-16	06-07	06-00	05-52	05-44	05-37	05-30	05-24	05-17	05-11	05-05	05-00	04-54	04-49	04-44	04-40	04-35
20	06-05	05-56	05-48	05-41	05-34	05-27	05-20	05-14	05-08	05-02	04-56	04-51	04-45	04-40	04-35	04-31	04-27
40	05-54	05-45	05-38	05-30	05-24	05-17	05-10	05-04	04-58	04-53	04-47	04-42	04-37	04-32	04-27	04-23	04-19
11 00	05-43	05-35	05-28	05-21	05-14	05-07	05-01	04-55	04-50	04-44	04-39	04-34	04-29	04-24	04-19	04-15	04-11
20	05-34	05-26	05-19	05-12	05-05	04-58	04-53	04-47	04-41	04-36	04-31	04-26	04-21	04-16	04-12	04-08	04-04
40	05-24	05-17	05-10	05-03	04-57	04-50	04-45	04-39	04-33	04-28	04-23	04-18	04-14	04-09	04-05	04-01	03-57
12 00	05-15	05-08	05-01	04-55	04-49	04-42	04-37	04-31	04-26	04-21	04-16	04-11	04-07	04-02	03-58	03-54	03-51
20	05-07	05-00	04-53	04-47	04-41	04-35	04-30	04-24	04-19	04-14	04-09	04-05	04-00	03-56	03-52	03-48	03-44
40	04-59	04-52	04-46	04-39	04-34	04-28	04-21	04-17	04-12	04-07	04-03	03-58	03-54	03-50	03-46	03-42	03-39

Table 1a. Astronomic Refraction Corrected for Temperature (Degrees)—Continued

Observed altitude	Temperature °F.																
	-30	-20	-10	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100	+110	+120	+130
0	" "	" "	" "	" "	" "	" "	" "	" "	" "	" "	" "	" "	" "	" "	" "	" "	" "
13 00	04-51	04-45	04-38	04-32	04-27	04-21	04-16	04-11	04-06	04-01	03-56	03-52	03-48	03-44	03-40	03-36	03-33
20	04-44	04-37	04-31	04-25	04-20	04-14	04-09	04-04	04-00	03-55	03-50	03-46	03-42	03-38	03-34	03-31	03-27
40	04-37	04-31	04-25	04-19	04-14	04-08	04-03	03-58	03-54	03-49	03-45	03-41	03-37	03-33	03-29	03-26	03-23
14 00	04-31	04-24	04-19	04-13	04-08	04-02	03-58	03-53	03-48	03-44	03-40	03-36	03-32	03-28	03-24	03-21	03-19
20	04-24	04-18	04-12	04-07	04-02	03-57	03-52	03-47	03-43	03-39	03-34	03-31	03-27	03-23	03-19	03-16	03-13
40	04-18	04-12	04-07	04-01	03-56	03-51	03-47	03-41	03-38	03-34	03-29	03-26	03-22	03-18	03-15	03-12	03-09
15 00	04-12	04-06	04-01	03-56	03-51	03-46	03-42	03-37	03-33	03-29	03-25	03-21	03-17	03-14	03-10	03-07	03-04
20	04-07	04-01	03-56	03-51	03-46	03-41	03-37	03-32	03-28	03-24	03-20	03-17	03-13	03-10	03-06	03-03	03-00
40	04-01	03-56	03-51	03-46	03-41	03-36	03-32	03-28	03-24	03-20	03-16	03-12	03-09	03-05	03-02	02-59	02-57
16 00	03-56	03-51	03-46	03-41	03-36	03-32	03-27	03-23	03-19	03-15	03-12	03-08	03-05	03-01	02-58	02-55	02-53
20	03-51	03-46	03-41	03-36	03-32	03-27	03-23	03-19	03-15	03-12	03-08	03-04	03-01	02-58	02-55	02-52	02-49
40	03-47	03-41	03-36	03-32	03-27	03-23	03-19	03-15	03-11	03-07	03-04	03-00	02-57	02-54	02-51	02-48	02-46
17 00	03-42	03-37	03-32	03-27	03-23	03-19	03-15	03-11	03-07	03-04	03-00	02-57	02-54	02-51	02-48	02-45	02-42
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18 00	03-29	03-24	03-20	03-15	03-11	03-07	03-04	03-00	02-56	02-53	02-50	02-47	02-44	02-41	02-38	02-35	02-33
20	03-25	03-20	03-16	03-12	03-08	03-04	03-00	02-56	02-53	02-50	02-46	02-43	02-41	02-38	02-35	02-32	02-30
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19 00	03-18	03-13	03-09	03-05	03-01	02-57	02-53	02-50	02-47	02-43	02-40	02-37	02-35	02-32	02-29	02-27	02-24
20	03-14	03-09	03-05	03-01	02-58	02-54	02-50	02-47	02-44	02-40	02-37	02-35	02-32	02-29	02-26	02-24	02-22
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20 00	03-07	03-03	02-59	02-55	02-51	02-48	02-44	02-41	02-38	02-35	02-32	02-29	02-26	02-24	02-21	02-19	02-17
20	03-04	02-59	02-56	02-52	02-48	02-45	02-41	02-38	02-35	02-32	02-29	02-26	02-24	02-21	02-19	02-17	02-14
40	03-01	02-56	02-53	02-49	02-45	02-42	02-39	02-35	02-32	02-29	02-27	02-24	02-21	02-19	02-16	02-14	02-12
21 00	02-58	02-53	02-50	02-46	02-42	02-39	02-36	02-33	02-30	02-27	02-24	02-21	02-19	02-16	02-14	02-12	02-10
20	02-55	02-50	02-47	02-43	02-40	02-36	02-33	02-30	02-27	02-24	02-22	02-19	02-17	02-14	02-12	02-10	02-08
40	02-52	02-48	02-44	02-40	02-37	02-34	02-31	02-28	02-25	02-22	02-19	02-17	02-14	02-12	02-10	02-07	02-05
22 00	02-49	02-45	02-41	02-38	02-34	02-31	02-28	02-25	02-22	02-20	02-17	02-14	02-12	02-10	02-07	02-05	02-03
20	02-46	02-42	02-39	02-35	02-32	02-29	02-26	02-23	02-20	02-17	02-15	02-12	02-10	02-08	02-05	02-03	02-01
40	02-43	02-40	02-36	02-33	02-30	02-26	02-23	02-21	02-18	02-15	02-13	02-10	02-08	02-06	02-03	02-01	01-59
23 00	02-41	02-37	02-34	02-30	02-27	02-24	02-21	02-18	02-16	02-13	02-10	02-08	02-06	02-04	02-01	01-59	01-58
20	02-38	02-34	02-31	02-28	02-25	02-22	02-19	02-16	02-13	02-11	02-08	02-06	02-04	02-02	01-59	01-58	01-56
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24 00	02-33	02-30	02-26	02-23	02-20	02-17	02-15	02-12	02-09	02-07	02-04	02-02	02-00	01-58	01-56	01-54	01-52
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40	02-22	02-19	02-16	02-13	02-10	02-07	02-05	02-02	02-00	01-58	01-55	01-53	01-51	01-49	01-47	01-46	01-44
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20	02-18	02-15	02-12	02-09	02-06	02-04	02-01	01-59	01-56	01-54	01-52	01-50	01-48	01-46	01-44	01-43	01-41
40	02-16	02-13	02-10	02-07	02-05	02-02	02-00	01-57	01-55	01-53	01-50	01-48	01-47	01-45	01-43	01-41	01-40
27 00	02-14	02-11	02-08	02-05	02-03	02-00	01-58	01-55	01-53	01-51	01-49	01-47	01-45	01-43	01-41	01-40	01-38
20	02-12	02-09	02-06	02-04	02-01	01-59	01-56	01-54	01-52	01-49	01-47	01-45	01-44	01-42	01-40	01-38	01-37
40	02-10	02-07	02-05	02-02	01-59	01-57	01-55	01-52	01-50	01-48	01-46	01-44	01-42	01-40	01-38	01-37	01-35

Table 1a. Astronomic Refraction Corrected for Temperature (Degrees)—Continued

Observed altitude	Temperature °F.																
	-30	-20	-10	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100	+110	+120	+130
0	" "	" "	" "	" "	" "	" "	" "	" "	" "	" "	" "	" "	" "	" "	" "	" "	" "
28 00	02-09	02-06	02-03	02-00	01-58	01-55	01-53	01-51	01-48	01-46	01-44	01-43	01-41	01-39	01-37	01-36	01-34
20	02-07	02-04	02-01	01-59	01-56	01-54	01-51	01-49	01-47	01-45	01-43	01-41	01-39	01-37	01-36	01-34	01-33
40	02-05	02-02	02-00	01-57	01-54	01-52	01-50	01-48	01-46	01-43	01-41	01-40	01-38	01-36	01-34	01-33	01-31
29 00	02-03	02-01	01-58	01-55	01-53	01-51	01-48	01-46	01-44	01-42	01-40	01-38	01-37	01-35	01-33	01-32	01-30
20	02-02	01-59	01-56	01-54	01-51	01-49	01-47	01-45	01-43	01-41	01-39	01-37	01-35	01-34	01-32	01-30	01-29
40	02-00	01-57	01-55	01-52	01-50	01-48	01-45	01-43	01-41	01-39	01-37	01-36	01-34	01-32	01-31	01-29	01-28
30 00	01-59	01-56	01-53	01-51	01-48	01-46	01-44	01-42	01-40	01-38	01-36	01-34	01-33	01-31	01-30	01-28	01-27
20	01-57	01-54	01-52	01-49	01-47	01-45	01-43	01-41	01-39	01-37	01-35	01-33	01-32	01-30	01-28	01-27	01-25
40	01-56	01-53	01-50	01-48	01-46	01-43	01-41	01-39	01-37	01-36	01-34	01-32	01-30	01-29	01-27	01-26	01-24
31 00	01-54	01-51	01-49	01-46	01-44	01-42	01-40	01-38	01-36	01-34	01-32	01-31	01-29	01-28	01-26	01-25	01-23
20	01-52	01-50	01-47	01-45	01-43	01-41	01-39	01-37	01-35	01-33	01-31	01-30	01-28	01-26	01-25	01-24	01-22
40	01-51	01-48	01-46	01-44	01-42	01-39	01-37	01-35	01-34	01-32	01-30	01-28	01-27	01-25	01-24	01-22	01-21
32 00	01-50	01-47	01-45	01-42	01-40	01-38	01-36	01-34	01-32	01-31	01-29	01-27	01-26	01-24	01-23	01-21	01-20
30	01-48	01-45	01-43	01-40	01-38	01-36	01-34	01-33	01-31	01-29	01-27	01-26	01-24	01-23	01-21	01-20	01-19
33 00	01-45	01-43	01-41	01-39	01-36	01-34	01-33	01-31	01-29	01-27	01-26	01-24	01-22	01-21	01-20	01-18	01-17
30	01-44	01-41	01-39	01-37	01-35	01-33	01-31	01-29	01-27	01-26	01-24	01-22	01-21	01-20	01-18	01-17	01-16
34 00	01-42	01-39	01-37	01-35	01-33	01-31	01-29	01-27	01-26	01-24	01-22	01-21	01-19	01-18	01-17	01-15	01-14
30	01-40	01-37	01-35	01-33	01-31	01-29	01-28	01-26	01-24	01-23	01-21	01-19	01-18	01-17	01-15	01-14	01-13
35 00	01-38	01-36	01-33	01-31	01-30	01-28	01-26	01-24	01-22	01-21	01-19	01-18	01-17	01-15	01-14	01-13	01-12
30	01-36	01-34	01-32	01-30	01-28	01-26	01-24	01-23	01-21	01-19	01-18	01-17	01-15	01-14	01-12	01-11	01-10
36 00	01-34	01-32	01-30	01-28	01-26	01-24	01-23	01-21	01-20	01-18	01-16	01-15	01-14	01-12	01-11	01-10	01-09
30	01-33	01-30	01-28	01-27	01-25	01-23	01-21	01-20	01-18	01-17	01-15	01-14	01-12	01-11	01-10	01-09	01-08
37 00	01-31	01-29	01-27	01-25	01-23	01-21	01-20	01-18	01-17	01-15	01-14	01-12	01-11	01-10	01-09	01-08	01-06
30	01-29	01-27	01-25	01-23	01-22	01-20	01-18	01-17	01-15	01-14	01-12	01-11	01-10	01-09	01-07	01-06	01-05
38 00	01-28	01-26	01-24	01-22	01-20	01-19	01-17	01-15	01-14	01-13	01-11	01-10	01-09	01-07	01-06	01-05	01-04
30	01-26	01-24	01-22	01-21	01-19	01-17	01-16	01-14	01-13	01-11	01-10	01-09	01-07	01-06	01-05	01-04	01-03
39 00	01-25	01-23	01-21	01-19	01-17	01-16	01-14	01-13	01-11	01-10	01-09	01-07	01-06	01-05	01-04	01-03	01-02
30	01-23	01-21	01-19	01-18	01-16	01-14	01-13	01-12	01-10	01-09	01-07	01-06	01-05	01-04	01-03	01-02	01-01
40 00	01-22	01-20	01-18	01-16	01-15	01-13	01-12	01-10	01-09	01-08	01-06	01-05	01-04	01-03	01-02	01-01	01-00
30	01-20	01-18	01-17	01-15	01-13	01-12	01-10	01-09	01-08	01-06	01-05	01-04	01-03	01-02	01-01	01-00	00-59
41 00	01-19	01-17	01-15	01-14	01-12	01-11	01-09	01-09	01-08	01-06	01-05	01-04	01-03	01-02	01-01	00-59	00-58
30	01-18	01-16	01-14	01-12	01-11	01-09	01-08	01-07	01-05	01-04	01-03	01-02	01-01	01-00	00-59	00-58	00-57
42 00	01-16	01-14	01-13	01-11	01-10	01-08	01-07	01-05	01-04	01-03	01-02	01-01	01-00	00-58	00-57	00-56	00-55
30	01-15	01-13	01-11	01-10	01-08	01-07	01-05	01-04	01-03	01-02	01-01	01-00	00-59	00-57	00-56	00-55	00-54
43 00	01-14	01-12	01-10	01-09	01-07	01-06	01-05	01-03	01-02	01-01	01-00	00-59	00-58	00-56	00-55	00-54	00-53
30	01-12	01-11	01-09	01-08	01-06	01-05	01-04	01-02	01-01	01-00	00-59	00-58	00-57	00-56	00-55	00-54	00-53
44 00	01-11	01-09	01-08	01-06	01-05	01-04	01-02	01-01	01-00	00-59	00-58	00-57	00-56	00-55	00-54	00-53	00-52
30	01-10	01-08	01-07	01-05	01-04	01-03	01-01	01-00	00-59	00-58	00-57	00-56	00-55	00-54	00-53	00-52	00-51
45 00	01-09	01-07	01-06	01-04	01-03	01-01	01-00	00-59	00-58	00-57	00-56	00-55	00-54	00-53	00-52	00-51	00-50
30	01-07	01-06	01-04	01-03	01-02	01-00	00-59	00-58	00-57	00-56	00-55	00-54	00-53	00-52	00-51	00-50	00-49
46 00	01-06	01-05	01-03	01-02	01-01	00-59	00-58	00-57	00-56	00-55	00-54	00-53	00-52	00-51	00-50	00-49	00-48
30	01-05	01-04	01-02	01-01	01-00	00-58	00-57	00-56	00-55	00-54	00-53	00-52	00-51	00-50	00-49	00-48	00-47

Table 1a. Astronomic Refraction Corrected for Temperature (Degrees)—Continued

Observed altitude	Temperature °F.																
	-30	-20	-10	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100	+110	+120	+130
0	' "	' "	' "	' "	' "	' "	' "	' "	' "	' "	' "	' "	' "	' "	' "	' "	' "
47 00	01-04	01-03	01-01	01-00	00-59	00-57	00-56	00-55	00-54	00-53	00-52	00-51	00-50	00-49	00-48	00-48	00-47
30	01-03	01-01	01-00	00-59	00-58	00-56	00-55	00-54	00-53	00-52	00-51	00-50	00-49	00-48	00-47	00-47	00-46
48 00	01-02	01-00	00-59	00-58	00-57	00-55	00-54	00-53	00-52	00-51	00-50	00-49	00-48	00-47	00-47	00-46	00-45
30	01-01	00-59	00-58	00-57	00-56	00-54	00-53	00-52	00-51	00-50	00-49	00-48	00-48	00-47	00-46	00-45	00-44
49 00	01-00	00-58	00-57	00-56	00-55	00-53	00-52	00-51	00-50	00-49	00-48	00-48	00-47	00-46	00-45	00-44	00-44
30	00-59	00-57	00-56	00-55	00-54	00-52	00-51	00-50	00-49	00-48	00-48	00-47	00-46	00-45	00-44	00-44	00-43
50 00	00-58	00-56	00-55	00-54	00-53	00-52	00-51	00-50	00-49	00-48	00-47	00-46	00-45	00-44	00-43	00-43	00-42
51 00	00-56	00-54	00-53	00-52	00-51	00-50	00-49	00-48	00-47	00-46	00-45	00-44	00-44	00-43	00-42	00-41	00-41
52 00	00-54	00-52	00-51	00-50	00-49	00-48	00-47	00-46	00-45	00-44	00-43	00-43	00-42	00-41	00-40	00-40	00-39
53 00	00-52	00-50	00-49	00-48	00-47	00-46	00-45	00-44	00-44	00-43	00-42	00-41	00-40	00-40	00-39	00-38	00-38
54 00	00-50	00-49	00-48	00-47	00-46	00-45	00-44	00-43	00-42	00-41	00-41	00-40	00-39	00-38	00-38	00-37	00-37
55 00	00-48	00-47	00-46	00-45	00-44	00-43	00-42	00-41	00-40	00-40	00-39	00-38	00-38	00-37	00-36	00-36	00-35
56 00	00-46	00-45	00-44	00-43	00-42	00-41	00-41	00-40	00-39	00-38	00-38	00-37	00-36	00-36	00-35	00-34	00-34
57 00	00-45	00-44	00-43	00-42	00-41	00-40	00-39	00-38	00-38	00-37	00-36	00-36	00-35	00-34	00-34	00-33	00-33
58 00	00-43	00-42	00-41	00-40	00-39	00-38	00-38	00-37	00-36	00-36	00-35	00-34	00-34	00-33	00-32	00-32	00-31
59 00	00-41	00-40	00-39	00-39	00-38	00-37	00-36	00-35	00-35	00-34	00-33	00-33	00-32	00-32	00-31	00-31	00-30
60 00	00-40	00-39	00-38	00-37	00-36	00-35	00-35	00-34	00-33	00-33	00-32	00-32	00-31	00-30	00-30	00-29	00-29

Table 1b. Astronomic Refraction Corrected for Temperature (Mils)

TO BE SUBTRACTED FROM OBSERVED ALTITUDE OF SUN OR STAR

(Use values of observed altitude and temperature nearest the values tabulated as arguments.)

Observed altitude	Temperature °F																
	-30	-20	-10	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100	+110	+120	+130
m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
0	12.65	12.35	12.08	11.82	11.57	11.33	11.10	10.88	10.66	10.46	10.26	10.08	9.90	9.72	9.54	9.40	9.25
10	9.83	9.60	9.39	9.18	8.99	8.80	8.63	8.45	8.29	8.13	7.97	7.83	7.69	7.55	7.42	7.30	7.19
20	8.18	7.99	7.82	7.64	7.49	7.33	7.21	7.04	6.90	6.77	6.64	6.52	6.40	6.28	6.17	6.08	5.98
30	6.94	6.78	6.63	6.49	6.35	6.22	6.09	5.97	5.85	5.74	5.63	5.53	5.43	5.33	5.24	5.16	5.08
40	5.99	5.85	5.72	5.60	5.48	5.36	5.26	5.15	5.05	4.95	4.86	4.77	4.69	4.60	4.52	4.45	4.38
50	5.24	5.11	5.00	4.89	4.79	4.69	4.60	4.50	4.42	4.33	4.25	4.17	4.10	4.02	3.95	3.89	3.83
60	4.64	4.53	4.43	4.33	4.24	4.15	4.07	3.99	3.91	3.84	3.76	3.70	3.63	3.56	3.50	3.45	3.39
70	4.15	4.05	3.96	3.88	3.80	3.72	3.64	3.57	3.50	3.43	3.37	3.31	3.25	3.19	3.13	3.08	3.03
80	3.75	3.66	3.58	3.50	3.43	3.35	3.29	3.22	3.16	3.10	3.04	2.99	2.93	2.88	2.83	2.78	2.74
90	3.41	3.33	3.26	3.19	3.12	3.06	2.99	2.93	2.88	2.82	2.77	2.72	2.67	2.62	2.57	2.53	2.46
100	3.13	3.05	2.99	2.92	2.86	2.80	2.74	2.69	2.64	2.59	2.54	2.49	2.45	2.40	2.36	2.32	2.28
110	2.88	2.81	2.75	2.69	2.64	2.58	2.53	2.48	2.43	2.38	2.34	2.30	2.25	2.21	2.17	2.14	2.11
120	2.67	2.61	2.55	2.49	2.44	2.39	2.34	2.30	2.25	2.21	2.17	2.13	2.09	2.05	2.01	1.98	1.95
130	2.49	2.43	2.37	2.32	2.27	2.22	2.18	2.14	2.10	2.06	2.02	1.98	1.94	1.91	1.88	1.85	1.82
140	2.32	2.27	2.22	2.17	2.13	2.08	2.04	2.00	1.96	1.92	1.88	1.85	1.82	1.79	1.75	1.73	1.70
150	2.18	2.13	2.08	2.04	2.00	1.95	1.91	1.88	1.84	1.80	1.77	1.74	1.71	1.68	1.65	1.62	1.59
160	2.05	2.00	1.96	1.92	1.88	1.84	1.80	1.77	1.73	1.70	1.67	1.64	1.61	1.58	1.55	1.53	1.50
170	1.94	1.89	1.85	1.81	1.77	1.74	1.70	1.67	1.64	1.60	1.57	1.55	1.52	1.49	1.46	1.44	1.42
180	1.84	1.79	1.75	1.72	1.68	1.64	1.61	1.58	1.55	1.52	1.49	1.46	1.44	1.41	1.39	1.36	1.34
190	1.74	1.70	1.67	1.63	1.59	1.56	1.53	1.50	1.47	1.44	1.41	1.39	1.36	1.34	1.32	1.29	1.27
200	1.66	1.62	1.58	1.55	1.52	1.49	1.46	1.43	1.40	1.37	1.35	1.32	1.30	1.27	1.25	1.23	1.21
210	1.58	1.54	1.51	1.48	1.45	1.42	1.39	1.36	1.33	1.31	1.28	1.26	1.24	1.22	1.19	1.18	1.16
220	1.51	1.48	1.44	1.41	1.38	1.35	1.33	1.30	1.27	1.25	1.23	1.20	1.18	1.16	1.14	1.12	1.10
230	1.45	1.41	1.38	1.35	1.32	1.29	1.27	1.25	1.22	1.20	1.17	1.15	1.13	1.11	1.09	1.07	1.06
240	1.39	1.35	1.32	1.29	1.27	1.24	1.22	1.19	1.17	1.15	1.12	1.10	1.08	1.06	1.05	1.03	1.01
250	1.33	1.30	1.27	1.24	1.22	1.19	1.17	1.14	1.12	1.10	1.08	1.06	1.04	1.02	1.00	0.99	0.97
260	1.28	1.25	1.22	1.19	1.17	1.14	1.12	1.10	1.08	1.06	1.04	1.02	1.00	0.98	0.96	0.95	0.93
270	1.23	1.20	1.18	1.15	1.13	1.10	1.08	1.06	1.04	1.02	0.99	0.98	0.96	0.95	0.93	0.91	0.90
280	1.19	1.16	1.13	1.11	1.09	1.06	1.04	1.02	1.00	0.98	0.96	0.94	0.93	0.91	0.90	0.88	0.87
290	1.14	1.12	1.09	1.07	1.05	1.02	1.00	0.98	0.96	0.95	0.93	0.91	0.89	0.88	0.86	0.85	0.84
300	1.10	1.08	1.06	1.03	1.01	0.99	0.97	0.95	0.93	0.91	0.90	0.88	0.86	0.85	0.83	0.82	0.81
310	1.07	1.04	1.02	1.00	0.98	0.96	0.94	0.92	0.90	0.88	0.87	0.85	0.84	0.82	0.81	0.79	0.78
320	1.03	1.01	0.99	0.96	0.94	0.92	0.91	0.89	0.87	0.85	0.84	0.82	0.81	0.79	0.78	0.77	0.75
330	1.00	0.98	0.96	0.93	0.92	0.90	0.88	0.86	0.84	0.83	0.81	0.80	0.78	0.77	0.75	0.74	0.73
340	0.97	0.95	0.93	0.91	0.89	0.87	0.85	0.83	0.82	0.80	0.79	0.77	0.76	0.74	0.73	0.72	0.71
350	0.94	0.92	0.90	0.88	0.86	0.84	0.82	0.81	0.79	0.78	0.76	0.75	0.74	0.72	0.71	0.70	0.69
360	0.91	0.89	0.87	0.85	0.83	0.82	0.80	0.78	0.77	0.75	0.74	0.73	0.71	0.70	0.69	0.68	0.67
370	0.89	0.86	0.85	0.83	0.81	0.79	0.78	0.76	0.75	0.73	0.72	0.71	0.69	0.68	0.67	0.66	0.65
380	0.86	0.84	0.82	0.80	0.79	0.77	0.76	0.74	0.73	0.71	0.70	0.69	0.67	0.66	0.65	0.64	0.63
390	0.84	0.82	0.80	0.78	0.77	0.75	0.73	0.72	0.71	0.69	0.68	0.67	0.65	0.64	0.63	0.62	0.61
400	0.81	0.79	0.78	0.76	0.74	0.73	0.71	0.70	0.69	0.67	0.66	0.65	0.64	0.62	0.61	0.60	0.59

Table 1b. Astronomic Refraction Corrected for Temperature (Mils)—Continued

Observed altitude	Temperature °F																
	-30	-20	-10	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100	+110	+120	+130
410	0.79	0.77	0.76	0.74	0.72	0.71	0.70	0.68	0.67	0.65	0.64	0.63	0.62	0.61	0.60	0.59	0.58
420	0.77	0.75	0.74	0.72	0.71	0.69	0.68	0.66	0.65	0.64	0.63	0.61	0.60	0.59	0.58	0.57	0.56
430	0.75	0.73	0.72	0.70	0.69	0.67	0.66	0.65	0.63	0.62	0.61	0.60	0.59	0.58	0.57	0.56	0.55
440	0.73	0.71	0.70	0.68	0.67	0.66	0.64	0.63	0.62	0.61	0.59	0.58	0.57	0.56	0.55	0.54	0.54
450	0.71	0.70	0.68	0.67	0.65	0.64	0.63	0.61	0.60	0.59	0.58	0.57	0.56	0.55	0.54	0.53	0.52
460	0.70	0.68	0.66	0.65	0.64	0.62	0.61	0.60	0.59	0.58	0.56	0.55	0.54	0.53	0.53	0.52	0.51
470	0.68	0.66	0.65	0.64	0.62	0.61	0.60	0.58	0.57	0.56	0.55	0.54	0.53	0.52	0.51	0.50	0.50
480	0.66	0.65	0.63	0.62	0.61	0.59	0.58	0.57	0.56	0.55	0.54	0.53	0.52	0.51	0.50	0.49	0.48
490	0.65	0.63	0.62	0.60	0.59	0.58	0.57	0.56	0.55	0.54	0.52	0.52	0.51	0.50	0.49	0.48	0.47
500	0.63	0.62	0.60	0.59	0.58	0.57	0.55	0.54	0.53	0.52	0.51	0.50	0.49	0.49	0.48	0.47	0.46
510	0.62	0.62	0.59	0.58	0.56	0.55	0.54	0.53	0.52	0.51	0.50	0.49	0.48	0.47	0.47	0.46	0.45
520	0.60	0.59	0.58	0.56	0.55	0.54	0.53	0.52	0.51	0.50	0.49	0.48	0.47	0.46	0.46	0.45	0.44
530	0.59	0.58	0.56	0.55	0.54	0.53	0.52	0.51	0.50	0.49	0.48	0.47	0.46	0.45	0.45	0.44	0.43
540	0.58	0.56	0.55	0.54	0.53	0.52	0.51	0.50	0.49	0.48	0.47	0.46	0.45	0.44	0.43	0.43	0.42
550	0.56	0.55	0.54	0.53	0.52	0.51	0.50	0.49	0.48	0.47	0.46	0.45	0.44	0.43	0.42	0.42	0.41
560	0.55	0.54	0.53	0.52	0.50	0.49	0.48	0.47	0.47	0.46	0.45	0.44	0.43	0.42	0.42	0.41	0.40
570	0.54	0.53	0.52	0.50	0.49	0.48	0.47	0.46	0.46	0.45	0.44	0.44	0.43	0.42	0.41	0.40	0.39
580	0.53	0.52	0.50	0.49	0.48	0.47	0.46	0.45	0.45	0.44	0.43	0.42	0.41	0.41	0.40	0.39	0.39
590	0.52	0.50	0.49	0.48	0.47	0.46	0.45	0.44	0.44	0.43	0.42	0.41	0.40	0.40	0.39	0.38	0.38
600	0.51	0.49	0.48	0.47	0.46	0.45	0.44	0.44	0.43	0.42	0.41	0.40	0.40	0.39	0.38	0.38	0.37
610	0.50	0.48	0.47	0.46	0.45	0.44	0.44	0.43	0.42	0.41	0.40	0.40	0.39	0.38	0.37	0.37	0.36
620	0.49	0.47	0.46	0.45	0.44	0.43	0.43	0.42	0.41	0.40	0.39	0.39	0.38	0.37	0.37	0.36	0.35
630	0.48	0.46	0.45	0.44	0.44	0.43	0.42	0.41	0.40	0.39	0.39	0.38	0.37	0.37	0.36	0.35	0.35
640	0.47	0.45	0.44	0.43	0.43	0.42	0.41	0.40	0.39	0.39	0.38	0.37	0.36	0.36	0.35	0.35	0.34
650	0.46	0.45	0.44	0.43	0.42	0.41	0.40	0.39	0.38	0.38	0.37	0.36	0.36	0.35	0.34	0.34	0.33
660	0.45	0.44	0.43	0.42	0.41	0.40	0.39	0.38	0.38	0.37	0.36	0.36	0.35	0.34	0.34	0.33	0.33
670	0.44	0.43	0.42	0.41	0.40	0.39	0.38	0.38	0.37	0.36	0.36	0.35	0.34	0.34	0.33	0.33	0.32
680	0.43	0.42	0.41	0.40	0.39	0.39	0.38	0.37	0.36	0.36	0.35	0.34	0.34	0.33	0.32	0.32	0.31
690	0.42	0.41	0.40	0.39	0.39	0.38	0.37	0.36	0.36	0.35	0.34	0.34	0.33	0.32	0.32	0.31	0.31
700	0.41	0.40	0.39	0.39	0.38	0.37	0.36	0.36	0.35	0.34	0.33	0.33	0.32	0.32	0.31	0.31	0.30
710	0.40	0.40	0.39	0.38	0.37	0.36	0.36	0.35	0.34	0.33	0.33	0.32	0.32	0.31	0.31	0.30	0.30
720	0.40	0.39	0.38	0.37	0.36	0.36	0.35	0.34	0.33	0.33	0.32	0.32	0.31	0.30	0.30	0.29	0.29
730	0.39	0.38	0.37	0.36	0.36	0.35	0.34	0.33	0.33	0.32	0.31	0.31	0.30	0.30	0.29	0.29	0.28
740	0.38	0.37	0.36	0.36	0.35	0.34	0.33	0.33	0.32	0.32	0.31	0.30	0.30	0.29	0.29	0.28	0.28
750	0.37	0.36	0.36	0.35	0.34	0.33	0.33	0.32	0.32	0.31	0.30	0.30	0.29	0.29	0.28	0.28	0.27
760	0.37	0.36	0.35	0.34	0.34	0.33	0.32	0.32	0.31	0.30	0.30	0.29	0.29	0.28	0.28	0.27	0.27
770	0.36	0.35	0.34	0.34	0.33	0.32	0.32	0.31	0.30	0.30	0.29	0.29	0.28	0.28	0.27	0.27	0.26
780	0.35	0.34	0.34	0.33	0.32	0.32	0.31	0.30	0.30	0.29	0.29	0.28	0.28	0.27	0.27	0.26	0.26
790	0.35	0.34	0.33	0.32	0.32	0.31	0.30	0.30	0.29	0.29	0.28	0.28	0.27	0.27	0.26	0.26	0.25
800	0.34	0.33	0.32	0.32	0.31	0.30	0.30	0.29	0.29	0.28	0.28	0.27	0.27	0.26	0.26	0.25	0.25
810	0.33	0.32	0.32	0.31	0.30	0.30	0.29	0.29	0.28	0.27	0.27	0.26	0.26	0.26	0.25	0.25	0.24
820	0.33	0.32	0.31	0.30	0.30	0.29	0.29	0.28	0.27	0.27	0.26	0.26	0.25	0.25	0.25	0.24	0.24
830	0.32	0.31	0.31	0.30	0.29	0.29	0.28	0.28	0.27	0.26	0.26	0.25	0.25	0.25	0.24	0.24	0.23
840	0.31	0.31	0.30	0.29	0.29	0.28	0.27	0.27	0.26	0.26	0.25	0.25	0.24	0.24	0.24	0.23	0.23
850	0.31	0.30	0.29	0.29	0.28	0.27	0.27	0.26	0.26	0.25	0.25	0.24	0.24	0.24	0.23	0.23	0.22
860	0.30	0.29	0.29	0.28	0.28	0.27	0.26	0.26	0.25	0.25	0.24	0.24	0.24	0.23	0.23	0.22	0.22
870	0.30	0.29	0.28	0.28	0.27	0.26	0.26	0.25	0.25	0.24	0.24	0.24	0.23	0.23	0.22	0.22	0.22
880	0.29	0.28	0.28	0.27	0.26	0.25	0.25	0.25	0.24	0.24	0.23	0.23	0.23	0.22	0.22	0.21	0.21
890	0.28	0.28	0.27	0.27	0.26	0.25	0.25	0.24	0.24	0.23	0.23	0.23	0.22	0.22	0.21	0.21	0.21
900	0.28	0.27	0.27	0.26	0.25	0.25	0.24	0.24	0.23	0.23	0.23	0.22	0.22	0.21	0.21	0.21	0.20

Table 1b. Astronomic Refraction Corrected for Temperature (Mils)—Continued

Observed altitude	Temperature °F																
	-30	-20	-10	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100	+110	+120	+130
ϕ	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
910	0.27	0.27	0.26	0.25	0.25	0.24	0.24	0.23	0.23	0.23	0.22	0.22	0.21	0.21	0.21	0.20	0.20
920	0.27	0.26	0.26	0.25	0.24	0.24	0.23	0.23	0.23	0.22	0.22	0.21	0.21	0.21	0.20	0.20	0.20
930	0.26	0.26	0.25	0.24	0.24	0.23	0.23	0.23	0.22	0.22	0.21	0.21	0.20	0.20	0.20	0.19	0.19
940	0.26	0.25	0.25	0.24	0.24	0.23	0.23	0.22	0.22	0.22	0.21	0.21	0.20	0.20	0.20	0.19	0.19
950	0.25	0.25	0.24	0.23	0.23	0.22	0.22	0.22	0.21	0.21	0.20	0.20	0.20	0.19	0.19	0.19	0.18
960	0.25	0.24	0.24	0.23	0.23	0.22	0.22	0.21	0.21	0.20	0.20	0.20	0.19	0.19	0.19	0.18	0.18
970	0.24	0.24	0.23	0.23	0.22	0.22	0.21	0.21	0.20	0.20	0.20	0.19	0.19	0.19	0.18	0.18	0.18
980	0.24	0.23	0.23	0.22	0.22	0.21	0.21	0.20	0.20	0.20	0.19	0.19	0.19	0.18	0.18	0.18	0.17
990	0.23	0.23	0.22	0.22	0.21	0.21	0.20	0.20	0.20	0.19	0.19	0.18	0.18	0.18	0.17	0.17	0.17
1000	0.23	0.22	0.22	0.21	0.21	0.20	0.20	0.19	0.19	0.19	0.18	0.18	0.18	0.17	0.17	0.17	0.17
1010	0.22	0.22	0.21	0.21	0.20	0.20	0.19	0.19	0.19	0.18	0.18	0.18	0.17	0.17	0.17	0.16	0.16
1020	0.22	0.21	0.21	0.20	0.20	0.19	0.19	0.19	0.18	0.18	0.18	0.17	0.17	0.17	0.16	0.16	0.16
1030	0.21	0.21	0.20	0.20	0.19	0.19	0.19	0.18	0.18	0.18	0.17	0.17	0.17	0.16	0.16	0.16	0.16
1040	0.21	0.20	0.20	0.19	0.19	0.19	0.18	0.18	0.18	0.17	0.17	0.17	0.16	0.16	0.16	0.15	0.15
1050	0.20	0.20	0.19	0.19	0.19	0.18	0.18	0.17	0.17	0.17	0.16	0.16	0.16	0.15	0.15	0.15	0.15
1060	0.20	0.19	0.19	0.19	0.18	0.18	0.17	0.17	0.17	0.16	0.16	0.16	0.16	0.15	0.15	0.15	0.15
1070	0.19	0.19	0.19	0.18	0.18	0.17	0.17	0.17	0.16	0.16	0.16	0.16	0.15	0.15	0.15	0.14	0.14
1080	0.19	0.19	0.18	0.18	0.17	0.17	0.17	0.16	0.16	0.16	0.15	0.15	0.15	0.15	0.14	0.14	0.14
1090	0.19	0.18	0.18	0.17	0.17	0.17	0.16	0.16	0.16	0.15	0.15	0.15	0.15	0.14	0.14	0.14	0.14
1100	0.18	0.18	0.17	0.17	0.17	0.16	0.16	0.16	0.15	0.15	0.15	0.14	0.14	0.14	0.14	0.13	0.13
1110	0.18	0.17	0.17	0.17	0.16	0.16	0.16	0.15	0.15	0.15	0.14	0.14	0.14	0.14	0.13	0.13	0.13
1120	0.17	0.17	0.17	0.16	0.16	0.15	0.15	0.15	0.15	0.14	0.14	0.14	0.14	0.13	0.13	0.13	0.13
1130	0.17	0.16	0.16	0.16	0.15	0.15	0.15	0.15	0.14	0.14	0.14	0.13	0.13	0.13	0.13	0.13	0.12
1140	0.16	0.16	0.16	0.15	0.15	0.15	0.14	0.14	0.14	0.14	0.13	0.13	0.13	0.13	0.12	0.12	0.12
1150	0.16	0.16	0.15	0.15	0.15	0.14	0.14	0.14	0.14	0.13	0.13	0.13	0.13	0.12	0.12	0.12	0.12
1160	0.16	0.15	0.15	0.15	0.14	0.14	0.14	0.13	0.13	0.13	0.13	0.12	0.12	0.12	0.12	0.12	0.11
1170	0.15	0.15	0.15	0.14	0.14	0.14	0.13	0.13	0.13	0.13	0.12	0.12	0.12	0.12	0.11	0.11	0.11
1180	0.15	0.15	0.14	0.14	0.14	0.13	0.13	0.13	0.13	0.12	0.12	0.12	0.12	0.11	0.11	0.11	0.11
1190	0.14	0.14	0.14	0.14	0.13	0.13	0.13	0.12	0.12	0.12	0.12	0.12	0.11	0.11	0.11	0.11	0.11
1200	0.14	0.14	0.13	0.13	0.13	0.13	0.12	0.12	0.12	0.12	0.11	0.11	0.11	0.11	0.11	0.10	0.10

Table 1c. Pressure Correction Factor, *C_B*
(Apply to values in tables 1a or 1b)

Barometer		C B	Barometer		C B	Barometer		C B
Inches	Millibars		Inches	Millibars		Inches	Millibars	
20.0	677	0.670	23.8	806	0.796	27.4	928	0.916
20.1	681	0.673	23.9	809	0.799	27.5	931	0.920
20.2	684	0.676				27.6	935	0.923
20.3	687	0.679				27.7	938	0.926
20.4	691	0.682	24.0	813	0.803			
			24.1	816	0.806			
20.5	694	0.685	24.2	820	0.809	27.8	941	0.929
20.6	698	0.688	24.3	823	0.813	27.9	945	0.933
20.7	701	0.692				28.0	948	0.936
20.8	704	0.696	24.4	826	0.816	28.1	952	0.939
20.9	708	0.699	24.5	830	0.820	28.2	955	0.942
			24.6	833	0.823			
21.0	711	0.703	24.7	836	0.826	28.3	958	0.946
21.1	715	0.706	24.8	840	0.829	28.4	962	0.949
21.2	718	0.709				28.5	965	0.953
21.3	721	0.712	24.9	843	0.832	28.6	969	0.956
21.4	725	0.716	25.0	847	0.835	28.7	972	0.959
			25.1	850	0.838			
21.5	728	0.719	25.2	853	0.842	28.8	975	0.963
21.6	731	0.722	25.3	857	0.846	28.9	979	0.966
21.7	735	0.725				29.0	982	0.970
21.8	738	0.729	25.4	860	0.849	29.1	985	0.973
21.9	742	0.732	25.5	864	0.853	29.2	989	0.976
			25.6	867	0.856			
22.0	745	0.735	25.7	870	0.859	29.3	992	0.979
22.1	748	0.739	25.8	874	0.862	29.4	996	0.983
22.2	752	0.742				29.5	999	0.986
22.3	755	0.746	25.9	877	0.866	29.6	1002	0.989
22.4	759	0.749	26.0	880	0.869	29.7	1006	0.992
			26.1	884	0.872			
22.5	762	0.752	26.2	887	0.875	29.8	1009	0.996
22.6	765	0.755	26.3	891	0.879	29.9	1013	0.999
22.7	769	0.759				30.0	1016	1.003
22.8	772	0.762	26.4	894	0.882	30.1	1019	1.007
22.9	775	0.766	26.5	897	0.885	30.2	1023	1.010
			26.6	901	0.889			
23.0	779	0.770	26.7	904	0.892	30.3	1026	1.013
23.1	782	0.773	26.8	908	0.896	30.4	1029	1.016
23.2	786	0.776				30.5	1033	1.020
23.3	789	0.779	26.9	911	0.899	30.6	1036	1.023
23.4	792	0.783	27.0	914	0.902	30.7	1040	1.026
			27.1	918	0.905			
23.5	796	0.786	27.2	921	0.909	30.8	1043	1.029
23.6	799	0.789	27.3	924	0.912	30.9	1046	1.033
23.7	803	0.792				31.0	1050	1.036

Note. Omit Pressure correction Factor for artillery surveys of fourth-order (1:3000) or lesser accuracies.

Table 2a. Sun, 1988, for Zero Hours Universal Time (GMT)

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS				DAILY CHANGE [SEC]			
	°	'	''	DAILY CHANGE [SEC]	MILS	DAILY CHANGE [MILS]		MIN	SEC	HR MIN SEC
JAN 0 TH	-23	09	14		-411.62			-02	33.6	06 35 33.5
JAN 1 FR	-23	04	58	+256	-410.36	+1.26	-28.8	-03	02.4	06 39 30.2
2 SA	-23	00	15	+283	-408.96	+1.40	-28.4	-03	30.8	06 43 26.7
3 SU	-22	55	04	+311	-407.43	+1.53	-28.0	-03	58.8	06 47 23.3
4 MO	-22	49	26	+338	-405.76	+1.67	-27.8	-04	26.6	06 51 19.9
5 TU	-22	43	21	+365	-403.96	+1.80	-27.3	-04	53.9	06 55 16.4
6 WE	-22	36	49	+392	-402.02	+1.94	-27.0	-05	20.9	06 59 13.0
7 TH	-22	29	50	+419	-399.95	+2.07	-26.5	-05	47.4	07 03 09.5
8 FR	-22	22	24	+446	-397.75	+2.20	-26.0	-06	13.4	07 07 06.1
9 SA	-22	14	32	+472	-395.42	+2.33	-25.6	-06	39.0	07 11 02.6
10 SU	-22	06	14	+498	-392.96	+2.46	-25.1	-07	04.1	07 14 59.2
11 MO	-21	57	30	+524	-390.37	+2.59	-24.5	-07	28.6	07 18 55.8
12 TU	-21	48	20	+550	-387.65	+2.72	-24.0	-07	52.6	07 22 52.3
13 WE	-21	38	44	+576	-384.81	+2.84	-23.5	-08	16.1	07 26 48.9
14 TH	-21	28	43	+601	-381.84	+2.97	-22.8	-08	38.9	07 30 45.4
15 FR	-21	18	18	+625	-378.76	+3.08	-22.2	-09	01.1	07 34 42.0
16 SA	-21	07	27	+651	-375.54	+3.22	-21.6	-09	22.7	07 38 38.5
17 SU	-20	56	13	+674	-372.21	+3.33	-21.0	-09	43.7	07 42 35.1
18 MO	-20	44	34	+699	-368.76	+3.45	-20.2	-10	03.9	07 46 31.7
19 TU	-20	32	31	+723	-365.19	+3.57	-19.6	-10	23.5	07 50 28.2
20 WE	-20	20	06	+745	-361.51	+3.68	-18.8	-10	42.3	07 54 24.8
21 TH	-20	07	17	+769	-357.71	+3.80	-18.1	-11	00.4	07 58 21.4
22 FR	-19	54	05	+792	-353.80	+3.91	-17.4	-11	17.8	08 02 17.9
23 SA	-19	40	32	+813	-349.79	+4.01	-16.5	-11	34.3	08 06 14.5
24 SU	-19	26	36	+836	-345.66	+4.13	-15.8	-11	50.1	08 10 11.0
25 MO	-19	12	19	+857	-341.43	+4.23	-15.0	-12	05.1	08 14 07.6
26 TU	-18	57	41	+878	-337.09	+4.34	-14.1	-12	19.2	08 18 04.1
27 WE	-18	42	42	+899	-332.65	+4.44	-13.4	-12	32.6	08 22 00.7
28 TH	-18	27	23	+919	-328.11	+4.54	-12.5	-12	45.1	08 25 57.2
29 FR	-18	11	44	+939	-323.48	+4.63	-11.7	-12	56.8	08 29 53.8
30 SA	-17	55	45	+959	-318.74	+4.74	-10.9	-13	07.7	08 33 50.4
31 SU	-17	39	27	+978	-313.91	+4.83	-10.0	-13	17.7	08 37 46.9
				+978		+4.83	-10.0			

Table 2a. Sun, 1988, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS				DAILY CHANGE (SEC)			
	°	'	"	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)		MIN	SEC	HR MIN SEC
FEB 1 MO	-17	22	51		-308.99			-13	26.9	08 41 43.5
2 TU	-17	05	56	+1015	-303.98	+5.01	-8.4	-13	35.3	08 45 40.0
3 WE	-16	48	43	+1033	-298.88	+5.10	-7.6	-13	42.9	08 49 36.6
4 TH	-16	31	12	+1051	-293.69	+5.19	-6.8	-13	49.7	08 53 33.2
5 FR	-16	13	24	+1068	-288.41	+5.28	-5.9	-13	55.6	08 57 29.7
6 SA	-15	55	19	+1085	-283.06	+5.35	-5.2	-14	00.8	09 01 26.3
7 SU	-15	36	58	+1101	-277.62	+5.44	-4.3	-14	05.1	09 05 22.8
8 MO	-15	18	21	+1117	-272.10	+5.52	-3.6	-14	08.7	09 09 19.4
9 TU	-14	59	28	+1133	-266.51	+5.59	-2.8	-14	11.5	09 13 15.9
10 WE	-14	40	20	+1148	-260.84	+5.67	-2.0	-14	13.5	09 17 12.5
11 TH	-14	20	57	+1163	-255.10	+5.74	-1.2	-14	14.7	09 21 09.0
12 FR	-14	01	20	+1177	-249.28	+5.82	-.5	-14	15.2	09 25 05.6
13 SA	-13	41	28	+1192	-243.40	+5.88	+.3	-14	14.9	09 29 02.1
14 SU	-13	21	23	+1205	-237.45	+5.95	+1.0	-14	13.9	09 32 58.7
15 MO	-13	01	05	+1218	-231.43	+6.02	+1.7	-14	12.2	09 36 55.3
16 TU	-12	40	33	+1232	-225.35	+6.08	+2.5	-14	09.7	09 40 51.8
17 WE	-12	19	50	+1243	-219.21	+6.14	+3.2	-14	06.5	09 44 48.4
18 TH	-11	58	55	+1255	-213.01	+6.20	+3.8	-14	02.7	09 48 44.9
19 FR	-11	37	48	+1267	-206.76	+6.25	+4.6	-13	58.1	09 52 41.5
20 SA	-11	16	30	+1278	-200.44	+6.32	+5.3	-13	52.8	09 56 38.0
21 SU	-10	55	02	+1288	-194.08	+6.36	+6.0	-13	46.8	10 00 34.6
22 MO	-10	33	24	+1298	-187.67	+6.41	+6.6	-13	40.2	10 04 31.1
23 TU	-10	11	36	+1308	-181.21	+6.46	+7.3	-13	32.9	10 08 27.7
24 WE	-09	49	38	+1318	-174.71	+6.50	+8.0	-13	24.9	10 12 24.2
25 TH	-09	27	32	+1326	-168.16	+6.55	+8.5	-13	16.4	10 16 20.8
26 FR	-09	05	18	+1334	-161.57	+6.59	+9.2	-13	07.2	10 20 17.4
27 SA	-08	42	55	+1343	-154.94	+6.63	+9.8	-12	57.4	10 24 13.9
28 SU	-08	20	25	+1350	-148.27	+6.67	+10.3	-12	47.1	10 28 10.5
29 MO	-07	57	48	+1357	-141.57	+6.70	+10.9	-12	36.2	10 32 07.0
				+1357		+6.70	+10.9			

Table 2a. Sun, 1988, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS		MIN	SEC	DAILY CHANGE (SEC)	HR	MIN	SEC
	°	' "	DAILY CHANGE (SEC)	DAILY CHANGE (MILS)						
MAR 1 TU	-07	35 03		-134.83	-12	24.7		10	36	03.6
2 WE	-07	12 13	+1370	-128.06	-12	12.8	+11.9	10	40	00.2
3 TH	-06	49 16	+1377	-121.26	-12	00.3	+12.5	10	43	56.7
4 FR	-06	26 13	+1383	-114.43	-11	47.4	+12.9	10	47	53.2
5 SA	-06	03 05	+1388	-107.58	-11	34.0	+13.4	10	51	49.8
6 SU	-05	39 53	+1392	-100.71	-11	20.2	+13.8	10	55	46.3
7 MO	-05	16 35	+1398	-93.80	-11	06.0	+14.2	10	59	42.9
8 TU	-04	53 13	+1402	-86.88	-10	51.4	+14.6	11	03	39.4
9 WE	-04	29 47	+1406	-79.94	-10	36.5	+14.9	11	07	36.0
10 TH	-04	06 18	+1409	-72.98	-10	21.2	+15.3	11	11	32.5
11 FR	-03	42 45	+1413	-66.00	-10	05.6	+15.6	11	15	29.1
12 SA	-03	19 10	+1415	-59.01	-09	49.7	+15.9	11	19	25.7
13 SU	-02	55 32	+1418	-52.01	-09	33.5	+16.2	11	23	22.2
14 MO	-02	31 52	+1420	-45.00	-09	17.0	+16.5	11	27	18.8
15 TU	-02	08 11	+1421	-37.98	-09	00.3	+16.7	11	31	15.4
16 WE	-01	44 28	+1423	-30.95	-08	43.4	+16.9	11	35	11.9
17 TH	-01	20 44	+1424	-23.92	-08	26.3	+17.1	11	39	08.5
18 FR	-00	57 00	+1424	-16.89	-08	09.0	+17.3	11	43	05.0
19 SA	-00	33 15	+1425	-9.85	-07	51.6	+17.4	11	47	01.5
20 SU	-00	09 32	+1423	-2.82	-07	34.0	+17.6	11	50	58.1
21 MO	00	14 12	+1424	+4.21	-07	16.2	+17.8	11	54	54.6
22 TU	00	37 54	+1422	+11.23	-06	58.3	+17.9	11	58	51.2
23 WE	01	01 35	+1421	+18.25	-06	40.3	+18.0	12	02	47.8
24 TH	01	25 13	+1418	+25.25	-06	22.3	+18.0	12	06	44.3
25 FR	01	48 50	+1417	+32.25	-06	04.1	+18.2	12	10	40.9
26 SA	02	12 24	+1414	+39.23	-05	45.9	+18.2	12	14	37.4
27 SU	02	35 55	+1411	+46.20	-05	27.7	+18.2	12	18	34.0
28 MO	02	59 23	+1408	+53.15	-05	09.5	+18.2	12	22	30.6
29 TU	03	22 47	+1404	+60.08	-04	51.3	+18.2	12	26	27.1
30 WE	03	46 07	+1400	+67.00	-04	33.2	+18.1	12	30	23.7
31 TH	04	09 23	+1396	+73.89	-04	15.1	+18.1	12	34	20.2
			+1396	+6.89						

Table 2a. Sun, 1988, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME			
	DEGREES		DAILY CHANGE (SEC)	MILS		MIN	SEC	DAILY CHANGE (SEC)	HR	MIN	SEC
	°	' "		MILS	DAILY CHANGE (MILS)						
APR 1 FR	04	32 34		+80.76		-03	57.1		12	38	16.7
2 SA	04	55 40	+1386	+87.60	+6.84	-03	39.1	+18.0	12	42	13.3
3 SU	05	18 41	+1381	+94.42	+6.82	-03	21.4	+17.7	12	46	09.8
4 MO	05	41 37	+1376	+101.22	+6.80	-03	03.7	+17.7	12	50	06.4
5 TU	06	04 26	+1369	+107.98	+6.76	-02	46.2	+17.5	12	54	02.9
6 WE	06	27 10	+1364	+114.72	+6.74	-02	29.0	+17.2	12	57	59.5
7 TH	06	49 46	+1356	+121.41	+6.69	-02	11.9	+17.1	13	01	56.1
8 FR	07	12 16	+1350	+128.08	+6.67	-01	55.1	+16.8	13	05	52.6
9 SA	07	34 39	+1343	+134.71	+6.63	-01	38.5	+16.6	13	09	49.2
10 SU	07	56 54	+1335	+141.30	+6.59	-01	22.2	+16.3	13	13	45.7
11 MO	08	19 02	+1328	+147.86	+6.56	-01	06.2	+16.0	13	17	42.3
12 TU	08	41 01	+1319	+154.38	+6.52	-00	50.5	+15.7	13	21	38.9
13 WE	09	02 51	+1310	+160.84	+6.46	-00	35.1	+15.4	13	25	35.4
14 TH	09	24 33	+1302	+167.27	+6.43	-00	20.0	+15.1	13	29	32.0
15 FR	09	46 05	+1292	+173.65	+6.38	-00	05.3	+14.7	13	33	28.5
16 SA	10	07 28	+1283	+179.99	+6.34	00	09.0	+14.3	13	37	25.1
17 SU	10	28 40	+1272	+186.27	+6.28	00	23.0	+14.0	13	41	21.6
18 MO	10	49 42	+1262	+192.50	+6.23	00	36.6	+13.6	13	45	18.2
19 TU	11	10 34	+1252	+198.69	+6.19	00	49.8	+13.2	13	49	14.7
20 WE	11	31 14	+1240	+204.81	+6.12	01	02.6	+12.8	13	53	11.3
21 TH	11	51 43	+1229	+210.88	+6.07	01	15.0	+12.4	13	57	07.8
22 FR	12	12 00	+1217	+216.89	+6.01	01	26.9	+11.9	14	01	04.4
23 SA	12	32 05	+1205	+222.84	+5.95	01	38.5	+11.6	14	05	01.0
24 SU	12	51 57	+1192	+228.73	+5.89	01	49.5	+11.0	14	08	57.5
25 MO	13	11 36	+1179	+234.55	+5.82	02	00.2	+10.7	14	12	54.1
26 TU	13	31 03	+1167	+240.31	+5.76	02	10.3	+10.1	14	16	50.6
27 WE	13	50 16	+1153	+246.00	+5.69	02	20.0	+9.7	14	20	47.2
28 TH	14	09 15	+1139	+251.63	+5.63	02	29.2	+9.2	14	24	43.7
29 FR	14	28 00	+1125	+257.19	+5.56	02	37.9	+8.7	14	28	40.3
30 SA	14	46 31	+1111	+262.67	+5.48	02	46.1	+8.2	14	32	36.8
			+1111		+5.48			+8.2			

Table 2a. Sun, 1988, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS				DAILY CHANGE (SEC)			
	°	'	"	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)		MIN	SEC	HR MIN SEC
MAY 1 SU	15	04	47		+268.08			02	53.8	14 36 33.4
2 MO	15	22	48	+1081	+273.42	+5.34	+7.1	03	00.9	14 40 29.9
3 TU	15	40	34	+1066	+278.69	+5.27	+6.6	03	07.5	14 44 26.5
4 WE	15	58	04	+1050	+283.87	+5.18	+6.0	03	13.5	14 48 23.0
5 TH	16	15	19	+1035	+288.98	+5.11	+5.5	03	19.0	14 52 19.6
6 FR	16	32	18	+1019	+294.01	+5.03	+4.9	03	23.9	14 56 16.2
7 SA	16	49	00	+1002	+298.96	+4.95	+4.3	03	28.2	15 00 12.7
8 SU	17	05	25	+985	+303.83	+4.87	+3.8	03	32.0	15 04 09.3
9 MO	17	21	34	+969	+308.61	+4.78	+3.1	03	35.1	15 08 05.9
10 TU	17	37	25	+951	+313.31	+4.70	+2.6	03	37.7	15 12 02.4
11 WE	17	52	58	+933	+317.92	+4.61	+1.9	03	39.6	15 15 59.0
12 TH	18	08	14	+916	+322.44	+4.52	+1.4	03	41.0	15 19 55.5
13 FR	18	23	11	+897	+326.87	+4.43	+0.8	03	41.8	15 23 52.1
14 SA	18	37	50	+879	+331.21	+4.34	+0.2	03	42.0	15 27 48.6
15 SU	18	52	10	+860	+335.46	+4.25	-0.4	03	41.6	15 31 45.2
16 MO	19	06	11	+841	+339.61	+4.15	-0.9	03	40.7	15 35 41.7
17 TU	19	19	52	+821	+343.66	+4.05	-1.6	03	39.1	15 39 38.3
18 WE	19	33	14	+802	+347.62	+3.96	-2.0	03	37.1	15 43 34.9
19 TH	19	46	15	+781	+351.48	+3.86	-2.7	03	34.4	15 47 31.4
20 FR	19	58	56	+761	+355.24	+3.76	-3.1	03	31.3	15 51 28.0
21 SA	20	11	17	+741	+358.90	+3.66	-3.7	03	27.6	15 55 24.5
22 SU	20	23	17	+720	+362.45	+3.55	-4.2	03	23.4	15 59 21.1
23 MO	20	34	56	+699	+365.91	+3.46	-4.7	03	18.7	16 03 17.7
24 TU	20	46	14	+678	+369.25	+3.34	-5.2	03	13.5	16 07 14.2
25 WE	20	57	10	+656	+372.49	+3.24	-5.7	03	07.8	16 11 10.8
26 TH	21	07	45	+635	+375.63	+3.14	-6.2	03	01.6	16 15 07.3
27 FR	21	17	57	+612	+378.65	+3.02	-6.6	02	55.0	16 19 03.9
28 SA	21	27	48	+591	+381.57	+2.92	-7.1	02	47.9	16 23 00.4
29 SU	21	37	16	+568	+384.38	+2.81	-7.5	02	40.4	16 26 57.0
30 MO	21	46	22	+546	+387.07	+2.69	-8.0	02	32.4	16 30 53.5
31 TU	21	55	05	+523	+389.65	+2.58	-8.4	02	24.0	16 34 50.1
				+523		+2.58	-8.4			

Table 2a. Sun, 1988, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS				DAILY CHANGE (SEC)			
	°	'	''	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)		MIN	SEC	HR MIN SEC
JUN 1 WE	22	03	25		+392.12			02	15.2	16 38 46.6
2 TH	22	11	22	+477	+394.48	+2.36	-9.2	02	06.0	16 42 43.2
3 FR	22	18	56	+454	+396.72	+2.24	-9.6	01	56.4	16 46 39.8
4 SA	22	26	07	+431	+398.85	+2.13	-9.9	01	46.5	16 50 36.3
5 SU	22	32	54	+407	+400.86	+2.01	-10.4	01	36.1	16 54 32.9
6 MO	22	39	18	+384	+402.76	+1.90	-10.6	01	25.5	16 58 29.5
7 TU	22	45	18	+360	+404.53	+1.77	-11.0	01	14.5	17 02 26.0
8 WE	22	50	53	+335	+406.19	+1.66	-11.4	01	03.1	17 06 22.6
9 TH	22	56	05	+312	+407.73	+1.54	-11.5	00	51.6	17 10 19.1
10 FR	23	00	53	+288	+409.15	+1.42	-11.9	00	39.7	17 14 15.7
11 SA	23	05	16	+263	+410.45	+1.30	-12.1	00	27.6	17 18 12.2
12 SU	23	09	15	+239	+411.63	+1.18	-12.4	00	15.2	17 22 08.8
13 MO	23	12	49	+214	+412.69	+1.06	-12.5	00	02.7	17 26 05.4
14 TU	23	15	59	+190	+413.62	+0.93	-12.7	-00	10.0	17 30 01.9
15 WE	23	18	44	+165	+414.44	+0.82	-12.8	-00	22.8	17 33 58.5
16 TH	23	21	05	+141	+415.14	+0.70	-12.9	-00	35.7	17 37 55.0
17 FR	23	23	00	+115	+415.70	+0.56	-13.1	-00	48.8	17 41 51.6
18 SA	23	24	31	+91	+416.15	+0.45	-13.0	-01	01.8	17 45 48.2
19 SU	23	25	37	+66	+416.48	+0.33	-13.2	-01	15.0	17 49 44.7
20 MO	23	26	18	+41	+416.68	+0.20	-13.1	-01	28.1	17 53 41.3
21 TU	23	26	35	+17	+416.77	+0.09	-13.1	-01	41.2	17 57 37.8
22 WE	23	26	26	-9	+416.72	-0.05	-13.0	-01	54.2	18 01 34.4
23 TH	23	25	53	-33	+416.56	-0.16	-13.0	-02	07.2	18 05 30.9
24 FR	23	24	55	-58	+416.27	-0.29	-12.9	-02	20.1	18 09 27.5
25 SA	23	23	32	-83	+415.86	-0.41	-12.7	-02	32.8	18 13 24.0
26 SU	23	21	45	-107	+415.33	-0.53	-12.7	-02	45.5	18 17 20.6
27 MO	23	19	33	-132	+414.68	-0.65	-12.4	-02	57.9	18 21 17.2
28 TU	23	16	56	-157	+413.91	-0.77	-12.3	-03	10.2	18 25 13.7
29 WE	23	13	55	-181	+413.01	-0.90	-12.1	-03	22.3	18 29 10.3
30 TH	23	10	30	-205	+412.00	-1.01	-11.9	-03	34.2	18 33 06.9
				-205		-1.01	-11.9			

Table 2a. Sun, 1988, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS		MIN	SEC	DAILY CHANGE (SEC)	HR	MIN	SEC
	°	' "	DAILY CHANGE (SEC)	DAILY CHANGE (MILS)						
JUL 1 FR	23	06 40		+410.86	-03	45.8		18	37	03.4
2 SA	23	02 27	-253	+409.61	-03	57.2	-11.4	18	41	00.0
3 SU	22	57 49	-278	+408.24	-04	08.3	-11.1	18	44	56.6
4 MO	22	52 47	-302	+406.75	-04	19.2	-10.9	18	48	53.1
5 TU	22	47 21	-326	+405.14	-04	29.7	-10.5	18	52	49.7
6 WE	22	41 31	-350	+403.41	-04	39.9	-10.2	18	56	46.2
7 TH	22	35 18	-373	+401.57	-04	49.8	-9.9	19	00	42.8
8 FR	22	28 41	-397	+399.61	-04	59.3	-9.5	19	04	39.3
9 SA	22	21 41	-420	+397.54	-05	08.5	-9.2	19	08	35.9
10 SU	22	14 17	-444	+395.34	-05	17.2	-8.7	19	12	32.4
11 MO	22	06 31	-466	+393.04	-05	25.6	-8.4	19	16	29.0
12 TU	21	58 22	-489	+390.63	-05	33.5	-7.9	19	20	25.6
13 WE	21	49 50	-512	+388.10	-05	40.9	-7.4	19	24	22.1
14 TH	21	40 55	-535	+385.46	-05	47.9	-7.0	19	28	18.7
15 FR	21	31 39	-556	+382.71	-05	54.4	-6.5	19	32	15.3
16 SA	21	22 00	-579	+379.85	-06	00.4	-6.0	19	36	11.8
17 SU	21	12 00	-600	+376.89	-06	05.9	-5.5	19	40	08.4
18 MO	21	01 38	-622	+373.82	-06	10.8	-4.9	19	44	04.9
19 TU	20	50 54	-644	+370.64	-06	15.1	-4.3	19	48	01.5
20 WE	20	39 50	-664	+367.36	-06	18.9	-3.8	19	51	58.0
21 TH	20	28 25	-685	+363.98	-06	22.2	-3.3	19	55	54.6
22 FR	20	16 39	-706	+360.49	-06	24.8	-2.6	19	59	51.1
23 SA	20	04 33	-726	+356.90	-06	26.9	-2.1	20	03	47.7
24 SU	19	52 07	-746	+353.22	-06	28.3	-1.4	20	07	44.2
25 MO	19	39 21	-766	+349.44	-06	29.2	-.9	20	11	40.8
26 TU	19	26 16	-785	+345.56	-06	29.4	-.2	20	15	37.4
27 WE	19	12 52	-804	+341.59	-06	29.1	+.3	20	19	33.9
28 TH	18	59 08	-824	+337.52	-06	28.1	+1.0	20	23	30.5
29 FR	18	45 06	-842	+333.36	-06	26.5	+1.6	20	27	27.1
30 SA	18	30 46	-860	+329.12	-06	24.3	+2.2	20	31	23.6
31 SU	18	16 07	-879	+324.78	-06	21.5	+2.8	20	35	20.2
			-879	-4.34			+2.8			

Table 2a. Sun, 1988, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME		SIDEREAL TIME		
	DEGREES		MILS						
	°	' "	DAILY CHANGE (SEC)	DAILY CHANGE (MILS)	MIN	SEC	DAILY CHANGE (SEC)	HR	MIN SEC
AUG 1 MO	18	01 10		+320.35	-06	18.1		20	39 16.7
2 TU	17	45 56	-914	+315.83	-06	14.1	+4.0	20	43 13.3
3 WE	17	30 24	-932	+311.23	-06	09.6	+4.5	20	47 09.8
4 TH	17	14 35	-949	+306.54	-06	04.4	+5.2	20	51 06.4
5 FR	16	58 29	-966	+301.77	-05	58.7	+5.7	20	55 02.9
6 SA	16	42 07	-982	+296.92	-05	52.4	+6.3	20	58 59.5
7 SU	16	25 28	-999	+291.99	-05	45.5	+6.9	21	02 56.0
8 MO	16	08 33	-1015	+286.98	-05	38.0	+7.5	21	06 52.6
9 TU	15	51 23	-1030	+281.89	-05	29.9	+8.1	21	10 49.2
10 WE	15	33 58	-1045	+276.73	-05	21.3	+8.6	21	14 45.7
11 TH	15	16 17	-1061	+271.49	-05	12.2	+9.1	21	18 42.3
12 FR	14	58 22	-1075	+266.18	-05	02.4	+9.8	21	22 38.8
13 SA	14	40 12	-1090	+260.80	-04	52.1	+10.3	21	26 35.4
14 SU	14	21 48	-1104	+255.35	-04	41.3	+10.8	21	30 32.0
15 MO	14	03 11	-1117	+249.83	-04	29.9	+11.4	21	34 28.5
16 TU	13	44 20	-1131	+244.25	-04	17.9	+12.0	21	38 25.0
17 WE	13	25 16	-1144	+238.60	-04	05.5	+12.4	21	42 21.6
18 TH	13	06 00	-1156	+232.89	-03	52.5	+13.0	21	46 18.1
19 FR	12	46 31	-1169	+227.12	-03	39.0	+13.5	21	50 14.7
20 SA	12	26 50	-1181	+221.28	-03	25.0	+14.0	21	54 11.3
21 SU	12	06 57	-1193	+215.39	-03	10.4	+14.6	21	58 07.8
22 MO	11	46 53	-1204	+209.45	-02	55.5	+14.9	22	02 04.4
23 TU	11	26 38	-1215	+203.45	-02	40.0	+15.5	22	06 00.9
24 WE	11	06 12	-1226	+197.39	-02	24.1	+15.9	22	09 57.5
25 TH	10	45 36	-1236	+191.29	-02	07.8	+16.3	22	13 54.1
26 FR	10	24 50	-1246	+185.14	-01	51.0	+16.8	22	17 50.6
27 SA	10	03 54	-1256	+178.93	-01	33.8	+17.2	22	21 47.2
28 SU	09	42 48	-1266	+172.68	-01	16.3	+17.5	22	25 43.7
29 MO	09	21 33	-1275	+166.39	-00	58.4	+17.9	22	29 40.3
30 TU	09	00 09	-1284	+160.04	-00	40.2	+18.2	22	33 36.8
31 WE	08	38 37	-1292	+153.66	-00	21.6	+18.6	22	37 33.4
			-1292	-6.38			+18.6		

Table 2a. Sun, 1988, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS				DAILY CHANGE (SEC)			
	°	'	"	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)		MIN	SEC	HR MIN SEC
SEP 1 TH	08	16	56		+147.24			-00	02.7	22 41 29.9
2 FR	07	55	06	-1310	+140.77	-6.47	+19.1	00	16.4	22 45 26.5
3 SA	07	33	09	-1317	+134.27	-6.50	+19.4	00	35.8	22 49 23.0
4 SU	07	11	05	-1324	+127.73	-6.54	+19.7	00	55.5	22 53 19.6
5 MO	06	48	53	-1332	+121.15	-6.58	+19.9	01	15.4	22 57 16.2
6 TU	06	26	35	-1338	+114.54	-6.61	+20.1	01	35.5	23 01 12.7
7 WE	06	04	10	-1345	+107.90	-6.64	+20.2	01	55.7	23 05 09.3
8 TH	05	41	39	-1351	+101.23	-6.67	+20.5	02	16.2	23 09 05.8
9 FR	05	19	02	-1357	+94.53	-6.70	+20.6	02	36.8	23 13 02.4
10 SA	04	56	20	-1362	+87.80	-6.73	+20.8	02	57.6	23 16 58.9
11 SU	04	33	32	-1368	+81.05	-6.75	+20.9	03	18.5	23 20 55.5
12 MO	04	10	40	-1372	+74.27	-6.78	+21.1	03	39.6	23 24 52.0
13 TU	03	47	44	-1376	+67.48	-6.79	+21.1	04	00.7	23 28 48.6
14 WE	03	24	44	-1380	+60.66	-6.82	+21.2	04	21.9	23 32 45.1
15 TH	03	01	39	-1385	+53.82	-6.84	+21.3	04	43.2	23 36 41.7
16 FR	02	38	32	-1387	+46.97	-6.85	+21.3	05	04.5	23 40 38.2
17 SA	02	15	22	-1390	+40.11	-6.86	+21.4	05	25.9	23 44 34.8
18 SU	01	52	08	-1394	+33.22	-6.89	+21.3	05	47.2	23 48 31.3
19 MO	01	28	53	-1395	+26.34	-6.88	+21.4	06	08.6	23 52 27.9
20 TU	01	05	36	-1397	+19.44	-6.90	+21.3	06	29.9	23 56 24.5
21 WE	00	42	17	-1399	+12.53	-6.91	+21.3	06	51.2	00 00 21.0
22 TH	00	18	57	-1400	+5.61	-6.92	+21.2	07	12.4	00 04 17.6
23 FR	-00	04	24	-1401	-1.30	-6.91	+21.2	07	33.6	00 08 14.1
24 SA	-00	27	46	-1402	-8.23	-6.93	+21.0	07	54.6	00 12 10.7
25 SU	-00	51	08	-1402	-15.15	-6.92	+20.9	08	15.5	00 16 07.2
26 MO	-01	14	30	-1402	-22.07	-6.92	+20.7	08	36.2	00 20 03.8
27 TU	-01	37	51	-1401	-28.99	-6.92	+20.5	08	56.7	00 24 00.3
28 WE	-02	01	13	-1402	-35.92	-6.93	+20.3	09	17.0	00 27 56.9
29 TH	-02	24	33	-1400	-42.83	-6.91	+20.1	09	37.1	00 31 53.4
30 FR	-02	47	52	-1399	-49.74	-6.91	+19.9	09	57.0	00 35 50.0
				-1399		-6.91	+19.9			

Table 2a. Sun, 1988, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS				DAILY CHANGE (SEC)			
	°	'	"	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)		MIN	SEC	HR MIN SEC
OCT 1 SA	-03	11	09	-1396	-56.64	-6.89	+19.2	10	16.5	00 39 46.5
2 SU	-03	34	25	-1393	-63.53	-6.88	+19.0	10	35.7	00 43 43.1
3 MO	-03	57	38	-1391	-70.41	-6.87	+18.5	10	54.7	00 47 39.7
4 TU	-04	20	49	-1387	-77.28	-6.85	+18.2	11	13.2	00 51 36.2
5 WE	-04	43	56	-1384	-84.13	-6.83	+17.9	11	31.4	00 55 32.8
6 TH	-05	07	00	-1381	-90.96	-6.82	+17.4	11	49.3	00 59 29.3
7 FR	-05	30	01	-1376	-97.78	-6.80	+17.0	12	06.7	01 03 25.9
8 SA	-05	52	57	-1372	-104.58	-6.77	+16.5	12	23.7	01 07 22.4
9 SU	-06	15	49	-1367	-111.35	-6.75	+16.2	12	40.2	01 11 19.0
10 MO	-06	38	36	-1361	-118.10	-6.72	+15.6	12	56.4	01 15 15.5
11 TU	-07	01	17	-1356	-124.82	-6.70	+15.2	13	12.0	01 19 12.1
12 WE	-07	23	53	-1350	-131.52	-6.67	+14.6	13	27.2	01 23 08.6
13 TH	-07	46	23	-1343	-138.19	-6.63	+14.1	13	41.8	01 27 05.2
14 FR	-08	08	46	-1336	-144.82	-6.60	+13.6	13	55.9	01 31 01.7
15 SA	-08	31	02	-1329	-151.42	-6.56	+13.1	14	09.5	01 34 58.3
16 SU	-08	53	11	-1321	-157.98	-6.52	+12.5	14	22.6	01 38 54.8
17 MO	-09	15	12	-1314	-164.50	-6.49	+11.9	14	35.1	01 42 51.4
18 TU	-09	37	06	-1305	-170.99	-6.45	+11.3	14	47.0	01 46 48.0
19 WE	-09	58	51	-1295	-177.44	-6.39	+10.7	14	58.3	01 50 44.5
20 TH	-10	20	26	-1287	-183.83	-6.36	+10.1	15	09.0	01 54 41.1
21 FR	-10	41	53	-1277	-190.19	-6.30	+9.5	15	19.1	01 58 37.6
22 SA	-11	03	10	-1267	-196.49	-6.26	+8.8	15	28.6	02 02 34.2
23 SU	-11	24	17	-1257	-202.75	-6.21	+8.1	15	37.4	02 06 30.7
24 MO	-11	45	14	-1245	-208.96	-6.15	+7.4	15	45.5	02 10 27.3
25 TU	-12	05	59	-1235	-215.11	-6.09	+6.7	15	52.9	02 14 23.8
26 WE	-12	26	34	-1224	-221.20	-6.05	+6.0	15	59.6	02 18 20.4
27 TH	-12	46	58	-1211	-227.25	-5.98	+5.2	16	05.6	02 22 16.9
28 FR	-13	07	09	-1200	-233.23	-5.93	+4.4	16	10.8	02 26 13.5
29 SA	-13	27	09	-1186	-239.16	-5.85	+3.7	16	15.2	02 30 10.1
30 SU	-13	46	55	-1174	-245.01	-5.80	+2.9	16	18.9	02 34 06.6
31 MO	-14	06	29	-1174	-250.81	-5.80	+2.9	16	21.8	02 38 03.2

Table 2a. Sun, 1988, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS		MIN	SEC	DAILY CHANGE (SEC)	HR	MIN	SEC
	°	'	''	DAILY CHANGE (SEC)						
NOV 1 TU	-14	25	50		-256.54			16	23.8	02 41 59.7
2 WE	-14	44	56	-1146	-262.20	-5.66	+1.3	16	25.1	02 45 56.3
3 TH	-15	03	48	-1132	-267.79	-5.59	+4	16	25.5	02 49 52.9
4 FR	-15	22	26	-1118	-273.31	-5.52	-4	16	25.1	02 53 49.4
5 SA	-15	40	49	-1103	-278.76	-5.45	-1.3	16	23.8	02 57 46.0
6 SU	-15	58	56	-1087	-284.13	-5.37	-2.0	16	21.8	03 01 42.5
7 MO	-16	16	47	-1071	-289.42	-5.29	-3.0	16	18.8	03 05 39.1
8 TU	-16	34	21	-1054	-294.62	-5.20	-3.8	16	15.0	03 09 35.6
9 WE	-16	51	39	-1038	-299.75	-5.13	-4.6	16	10.4	03 13 32.2
10 TH	-17	08	40	-1021	-304.79	-5.04	-5.5	16	04.9	03 17 28.7
11 FR	-17	25	23	-1003	-309.74	-4.95	-6.3	15	58.6	03 21 25.3
12 SA	-17	41	49	-986	-314.61	-4.87	-7.2	15	51.4	03 25 21.8
13 SU	-17	57	55	-966	-319.38	-4.77	-8.0	15	43.4	03 29 18.4
14 MO	-18	13	43	-948	-324.06	-4.68	-8.9	15	34.5	03 33 15.0
15 TU	-18	29	12	-929	-328.65	-4.59	-9.7	15	24.8	03 37 11.5
16 WE	-18	44	21	-909	-333.14	-4.49	-10.5	15	14.3	03 41 08.1
17 TH	-18	59	10	-889	-337.53	-4.39	-11.3	15	03.0	03 45 04.6
18 FR	-19	13	38	-868	-341.82	-4.29	-12.2	14	50.8	03 49 01.2
19 SA	-19	27	46	-848	-346.00	-4.18	-12.9	14	37.9	03 52 57.8
20 SU	-19	41	33	-827	-350.09	-4.09	-13.8	14	24.1	03 56 54.3
21 MO	-19	54	58	-805	-354.06	-3.97	-14.6	14	09.5	04 00 50.9
22 TU	-20	08	02	-784	-357.94	-3.88	-15.3	13	54.2	04 04 47.4
23 WE	-20	20	43	-761	-361.69	-3.75	-16.1	13	38.1	04 08 44.0
24 TH	-20	33	02	-739	-365.34	-3.65	-16.9	13	21.2	04 12 40.5
25 FR	-20	44	58	-716	-368.88	-3.54	-17.7	13	03.5	04 16 37.1
26 SA	-20	56	31	-693	-372.30	-3.42	-18.4	12	45.1	04 20 33.7
27 SU	-21	07	40	-669	-375.60	-3.30	-19.2	12	25.9	04 24 30.2
28 MO	-21	18	26	-646	-378.80	-3.20	-19.9	12	06.0	04 28 26.8
29 TU	-21	28	48	-622	-381.87	-3.07	-20.7	11	45.3	04 32 23.3
30 WE	-21	38	45	-597	-384.81	-2.94	-21.3	11	24.0	04 36 19.9
				-597		-2.94	-21.3			

Table 2a. Sun, 1988, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS		MIN	SEC	DAILY CHANGE (SEC)	HR	MIN	SEC
	°	'	"	DAILY CHANGE (SEC)						
DEC 1 TH	-21	48	17	-387.64	11	02.0	-22.7	04	40	16.5
2 FR	-21	57	25	-390.35	10	39.3	-23.4	04	44	13.0
3 SA	-22	06	07	-392.92	10	15.9	-23.9	04	48	09.6
4 SU	-22	14	24	-395.38	09	52.0	-24.6	04	52	06.1
5 MO	-22	22	15	-397.70	09	27.4	-25.1	04	56	02.7
6 TU	-22	29	40	-399.90	09	02.3	-25.7	04	59	59.2
7 WE	-22	36	38	-401.97	08	36.6	-26.1	05	03	55.8
8 TH	-22	43	10	-403.90	08	10.5	-26.7	05	07	52.3
9 FR	-22	49	15	-405.70	07	43.8	-27.1	05	11	48.9
10 SA	-22	54	53	-407.37	07	16.7	-27.5	05	15	45.5
11 SU	-23	00	04	-408.91	06	49.2	-27.8	05	19	42.0
12 MO	-23	04	47	-410.31	06	21.4	-28.3	05	23	38.6
13 TU	-23	09	04	-411.58	05	53.1	-28.5	05	27	35.2
14 WE	-23	12	52	-412.70	05	24.6	-28.8	05	31	31.7
15 TH	-23	16	13	-413.69	04	55.8	-29.0	05	35	28.3
16 FR	-23	19	05	-414.54	04	26.8	-29.3	05	39	24.8
17 SA	-23	21	30	-415.26	03	57.5	-29.4	05	43	21.4
18 SU	-23	23	27	-415.84	03	28.1	-29.5	05	47	17.9
19 MO	-23	24	55	-416.27	02	58.6	-29.7	05	51	14.5
20 TU	-23	25	56	-416.57	02	28.9	-29.7	05	55	11.1
21 WE	-23	26	28	-416.73	01	59.2	-29.7	05	59	07.6
22 TH	-23	26	32	-416.75	01	29.5	-29.8	06	03	04.2
23 FR	-23	26	08	-416.63	00	59.7	-29.8	06	07	00.7
24 SA	-23	25	15	-416.37	00	29.9	-29.7	06	10	57.3
25 SU	-23	23	55	-415.98	00	00.2	-29.7	06	14	53.9
26 MO	-23	22	06	-415.44	-00	29.5	-29.5	06	18	50.4
27 TU	-23	19	49	-414.76	-00	59.0	-29.4	06	22	47.0
28 WE	-23	17	04	-413.95	-01	28.4	-29.3	06	26	43.6
29 TH	-23	13	51	-412.99	-01	57.7	-29.1	06	30	40.1
30 FR	-23	10	11	-411.91	-02	26.8	-28.8	06	34	36.7
31 SA	-23	06	02	-410.68	-02	55.6	-28.5	06	38	33.2
32 SU	-23	01	25	-409.31	-03	24.1		06	42	29.8

Table 2b. Sun, 1989, for Zero Hours Universal Time (GMT)

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS				DAILY CHANGE (SEC)			
	°	'	''	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)		MIN	SEC	HR MIN SEC
JAN 0 SA	-23	06	02		-410.68			-02	55.6	06 38 33.2
JAN 1 SU	-23	01	25	+277	-409.31	+1.37	-28.5	-03	24.1	06 42 29.8
2 MO	-22	56	21	+304	-407.81	+1.50	-28.3	-03	52.4	06 46 26.3
3 TU	-22	50	49	+332	-406.17	+1.64	-28.0	-04	20.4	06 50 22.9
4 WE	-22	44	50	+359	-404.40	+1.77	-27.5	-04	47.9	06 54 19.4
5 TH	-22	38	24	+386	-402.49	+1.91	-27.3	-05	15.2	06 58 16.0
6 FR	-22	31	31	+413	-400.45	+2.04	-26.7	-05	41.9	07 02 12.6
7 SA	-22	24	12	+439	-398.28	+2.17	-26.4	-06	08.3	07 06 09.1
8 SU	-22	16	25	+467	-395.98	+2.30	-25.8	-06	34.1	07 10 05.7
9 MO	-22	08	13	+492	-393.55	+2.43	-25.4	-06	59.5	07 14 02.3
10 TU	-21	59	34	+519	-390.98	+2.57	-24.8	-07	24.3	07 17 58.8
11 WE	-21	50	30	+544	-388.30	+2.68	-24.2	-07	48.5	07 21 55.4
12 TH	-21	41	00	+570	-385.48	+2.82	-23.6	-08	12.1	07 25 51.9
13 FR	-21	31	05	+595	-382.54	+2.94	-23.0	-08	35.1	07 29 48.5
14 SA	-21	20	45	+620	-379.48	+3.06	-22.3	-08	57.4	07 33 45.0
15 SU	-21	10	00	+645	-376.30	+3.18	-21.7	-09	19.1	07 37 41.6
16 MO	-20	58	52	+668	-373.00	+3.30	-21.0	-09	40.1	07 41 38.1
17 TU	-20	47	19	+693	-369.58	+3.42	-20.3	-10	00.4	07 45 34.7
18 WE	-20	35	22	+717	-366.03	+3.55	-19.5	-10	19.9	07 49 31.3
19 TH	-20	23	03	+739	-362.39	+3.64	-18.9	-10	38.8	07 53 27.8
20 FR	-20	10	20	+763	-358.62	+3.77	-18.0	-10	56.8	07 57 24.4
21 SA	-19	57	15	+785	-354.74	+3.88	-17.4	-11	14.2	08 01 21.0
22 SU	-19	43	47	+808	-350.75	+3.99	-16.5	-11	30.7	08 05 17.5
23 MO	-19	29	58	+829	-346.66	+4.09	-15.8	-11	46.5	08 09 14.1
24 TU	-19	15	46	+852	-342.45	+4.21	-15.1	-12	01.6	08 13 10.6
25 WE	-19	01	14	+872	-338.14	+4.31	-14.2	-12	15.8	08 17 07.2
26 TH	-18	46	21	+893	-333.73	+4.41	-13.5	-12	29.3	08 21 03.7
27 FR	-18	31	07	+914	-329.22	+4.51	-12.7	-12	42.0	08 25 00.3
28 SA	-18	15	33	+934	-324.61	+4.61	-11.9	-12	53.9	08 28 56.8
29 SU	-17	59	39	+954	-319.90	+4.71	-11.0	-13	04.9	08 32 53.4
30 MO	-17	43	25	+974	-315.09	+4.81	-10.3	-13	15.2	08 36 49.9
31 TU	-17	26	53	+992	-310.19	+4.90	-9.5	-13	24.7	08 40 46.5
				+992		+4.90	-9.5			

Table 2b. Sun, 1989, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE			APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
			DEGREES		MILS		MIN	SEC	DAILY CHANGE (SEC)	HR	MIN	SEC
			°	'	"	DAILY CHANGE (SEC)						
						MILS						
FEB 1	WE		-17	10	02		-305.20		+5.09	-13	33.4	08 44 43.1
2	TH		-16	52	52	+1030	-300.11		+5.17	-13	41.3	08 48 39.6
3	FR		-16	35	25	+1047	-294.94		+5.26	-13	48.4	08 52 36.2
4	SA		-16	17	41	+1064	-289.68		+5.34	-13	54.7	08 56 32.8
5	SU		-15	59	39	+1082	-284.34		+5.42	-14	00.2	09 00 29.3
6	MO		-15	41	21	+1098	-278.92		+5.50	-14	04.9	09 04 25.9
7	TU		-15	22	47	+1114	-273.42		+5.58	-14	08.7	09 08 22.4
8	WE		-15	03	57	+1130	-267.84		+5.66	-14	11.8	09 12 19.0
9	TH		-14	44	51	+1146	-262.18		+5.73	-14	14.1	09 16 15.5
10	FR		-14	25	31	+1160	-256.45		+5.80	-14	15.6	09 20 12.1
11	SA		-14	05	57	+1174	-250.65		+5.86	-14	16.2	09 24 08.6
12	SU		-13	46	09	+1188	-244.79		+5.94	-14	16.1	09 28 05.2
13	MO		-13	26	07	+1202	-238.85		+6.00	-14	15.2	09 32 01.7
14	TU		-13	05	52	+1215	-232.85		+6.06	-14	13.6	09 35 58.3
15	WE		-12	45	25	+1227	-226.79		+6.12	-14	11.2	09 39 54.9
16	TH		-12	24	45	+1240	-220.67		+6.18	-14	08.0	09 43 51.4
17	FR		-12	03	54	+1251	-214.49		+6.24	-14	04.1	09 47 48.0
18	SA		-11	42	51	+1263	-208.25		+6.29	-13	59.5	09 51 44.5
19	SU		-11	21	37	+1274	-201.96		+6.34	-13	54.2	09 55 41.1
20	MO		-11	00	13	+1284	-195.62		+6.40	-13	48.3	09 59 37.7
21	TU		-10	38	38	+1295	-189.22		+6.44	-13	41.6	10 03 34.2
22	WE		-10	16	53	+1305	-182.78		+6.49	-13	34.3	10 07 30.8
23	TH		-09	54	59	+1314	-176.29		+6.53	-13	26.4	10 11 27.3
24	FR		-09	32	56	+1323	-169.76		+6.58	-13	17.9	10 15 23.8
25	SA		-09	10	44	+1332	-163.18		+6.62	-13	08.8	10 19 20.4
26	SU		-08	48	24	+1340	-156.56		+6.65	-12	59.1	10 23 16.9
27	MO		-08	25	56	+1348	-149.91		+6.70	-12	48.9	10 27 13.5
28	TU		-08	03	20	+1356	-143.21		+6.70	-12	38.2	10 31 10.1

Table 2b. Sun, 1989, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS				DAILY CHANGE (SEC)			
	°	'	''	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)		MIN	SEC	HR MIN SEC
MAR 1 WE	-07	40	37		-136.48			-12	26.9	10 35 06.6
2 TH	-07	17	47	+1370	-129.71	+6.77	+11.8	-12	15.1	10 39 03.2
3 FR	-06	54	51	+1376	-122.92	+6.79	+12.2	-12	02.9	10 42 59.7
4 SA	-06	31	49	+1382	-116.09	+6.83	+12.7	-11	50.2	10 46 56.3
5 SU	-06	08	41	+1388	-109.24	+6.85	+13.2	-11	37.0	10 50 52.9
6 MO	-05	45	28	+1393	-102.36	+6.88	+13.5	-11	23.5	10 54 49.4
7 TU	-05	22	11	+1397	-95.46	+6.90	+14.0	-11	09.5	10 58 46.0
8 WE	-04	58	49	+1402	-88.54	+6.92	+14.4	-10	55.1	11 02 42.5
9 TH	-04	35	23	+1406	-81.60	+6.94	+14.7	-10	40.4	11 06 39.1
10 FR	-04	11	54	+1409	-74.64	+6.96	+15.2	-10	25.2	11 10 35.6
11 SA	-03	48	22	+1412	-67.66	+6.98	+15.4	-10	09.8	11 14 32.2
12 SU	-03	24	47	+1415	-60.68	+6.98	+15.8	-09	54.0	11 18 28.7
13 MO	-03	01	09	+1418	-53.67	+7.01	+16.2	-09	37.8	11 22 25.3
14 TU	-02	37	30	+1419	-46.67	+7.00	+16.4	-09	21.4	11 26 21.8
15 WE	-02	13	49	+1421	-39.65	+7.02	+16.7	-09	04.7	11 30 18.4
16 TH	-01	50	08	+1421	-32.63	+7.02	+16.9	-08	47.8	11 34 14.9
17 FR	-01	26	25	+1423	-25.60	+7.03	+17.2	-08	30.6	11 38 11.5
18 SA	-01	02	42	+1423	-18.58	+7.02	+17.4	-08	13.2	11 42 08.1
19 SU	-00	38	59	+1423	-11.55	+7.03	+17.6	-07	55.6	11 46 04.6
20 MO	-00	15	17	+1422	-4.53	+7.02	+17.7	-07	37.9	11 50 01.2
21 TU	00	08	26	+1423	+2.50	+7.03	+17.9	-07	20.0	11 53 57.7
22 WE	00	32	07	+1421	+9.52	+7.02	+18.0	-07	02.0	11 57 54.3
23 TH	00	55	47	+1420	+16.53	+7.01	+18.1	-06	43.9	12 01 50.8
24 FR	01	19	25	+1418	+23.53	+7.00	+18.2	-06	25.7	12 05 47.3
25 SA	01	43	01	+1416	+30.52	+6.99	+18.3	-06	07.4	12 09 43.9
26 SU	02	06	35	+1414	+37.51	+6.99	+18.2	-05	49.2	12 13 40.4
27 MO	02	30	06	+1411	+44.47	+6.96	+18.3	-05	30.9	12 17 37.0
28 TU	02	53	35	+1409	+51.43	+6.96	+18.2	-05	12.7	12 21 33.6
29 WE	03	17	00	+1405	+58.37	+6.94	+18.2	-04	54.5	12 25 30.1
30 TH	03	40	21	+1401	+65.29	+6.92	+18.2	-04	36.3	12 29 26.7
31 FR	04	03	39	+1398	+72.19	+6.90	+18.1	-04	18.2	12 33 23.2
				+1398		+6.90	+18.1			

Table 2b. Sun, 1989, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS				DAILY CHANGE (SEC)			
	°	'	''	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)		MIN	SEC	HR MIN SEC
APR 1 SA	04	26	52		+79.07			-04	00.3	12 37 19.8
2 SU	04	50	00	+1388	+85.93	+6.86	+17.9	-03	42.4	12 41 16.4
3 MO	05	13	04	+1384	+92.76	+6.83	+17.7	-03	24.7	12 45 12.9
4 TU	05	36	02	+1378	+99.57	+6.81	+17.5	-03	07.2	12 49 09.5
5 WE	05	58	54	+1372	+106.34	+6.77	+17.4	-02	49.8	12 53 06.0
6 TH	06	21	40	+1366	+113.09	+6.75	+17.2	-02	32.6	12 57 02.5
7 FR	06	44	19	+1359	+119.80	+6.71	+17.0	-02	15.6	13 00 59.1
8 SA	07	06	51	+1352	+126.47	+6.67	+16.8	-01	58.8	13 04 55.7
9 SU	07	29	16	+1345	+133.12	+6.65	+16.5	-01	42.3	13 08 52.2
10 MO	07	51	34	+1338	+139.72	+6.60	+16.3	-01	26.0	13 12 48.8
11 TU	08	13	43	+1329	+146.29	+6.57	+16.1	-01	09.9	13 16 45.3
12 WE	08	35	44	+1321	+152.81	+6.52	+15.8	-00	54.1	13 20 41.9
13 TH	08	57	36	+1312	+159.29	+6.48	+15.5	-00	38.6	13 24 38.5
14 FR	09	19	19	+1303	+165.72	+6.43	+15.2	-00	23.4	13 28 35.0
15 SA	09	40	53	+1294	+172.11	+6.39	+14.9	-00	08.5	13 32 31.6
16 SU	10	02	17	+1284	+178.45	+6.34	+14.6	00	06.1	13 36 28.1
17 MO	10	23	31	+1274	+184.75	+6.30	+14.2	00	20.3	13 40 24.7
18 TU	10	44	34	+1263	+190.98	+6.23	+13.8	00	34.1	13 44 21.2
19 WE	11	05	27	+1253	+197.17	+6.19	+13.5	00	47.6	13 48 17.8
20 TH	11	26	09	+1242	+203.30	+6.13	+13.0	01	00.6	13 52 14.3
21 FR	11	46	39	+1230	+209.38	+6.08	+12.7	01	13.3	13 56 10.9
22 SA	12	06	58	+1219	+215.40	+6.02	+12.2	01	25.5	14 00 07.4
23 SU	12	27	06	+1208	+221.36	+5.96	+11.7	01	37.2	14 04 04.0
24 MO	12	47	00	+1194	+227.26	+5.90	+11.3	01	48.5	14 08 00.5
25 TU	13	06	43	+1183	+233.10	+5.84	+10.9	01	59.4	14 11 57.1
26 WE	13	26	12	+1169	+238.87	+5.77	+10.3	02	09.7	14 15 53.6
27 TH	13	45	29	+1157	+244.59	+5.72	+9.8	02	19.5	14 19 50.2
28 FR	14	04	32	+1143	+250.23	+5.64	+9.3	02	28.8	14 23 46.8
29 SA	14	23	21	+1129	+255.81	+5.58	+8.8	02	37.6	14 27 43.3
30 SU	14	41	56	+1115	+261.31	+5.50	+8.2	02	45.8	14 31 39.9
				+1115		+5.50	+8.2			

Table 2b. Sun, 1989, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS		MIN	SEC	DAILY CHANGE (SEC)	HR	MIN	SEC
	°	' "	DAILY CHANGE (SEC)	DAILY CHANGE (MILS)						
MAY 1 MO	15	00 17		+266.75	02	53.5		14	35	36.4
2 TU	15	18 22	+1085	+272.11	03	00.6	+7.1	14	39	33.0
3 WE	15	36 13	+1071	+277.40	03	07.2	+6.6	14	43	29.5
4 TH	15	53 48	+1055	+282.61	03	13.2	+6.0	14	47	26.1
5 FR	16	11 07	+1039	+287.74	03	18.7	+5.5	14	51	22.6
6 SA	16	28 11	+1024	+292.80	03	23.6	+4.9	14	55	19.2
7 SU	16	44 57	+1006	+297.76	03	27.9	+4.3	14	59	15.8
8 MO	17	01 27	+990	+302.65	03	31.7	+3.8	15	03	12.3
9 TU	17	17 40	+973	+307.46	03	34.9	+3.2	15	07	08.9
10 WE	17	33 35	+955	+312.17	03	37.5	+2.6	15	11	05.4
11 TH	17	49 13	+938	+316.80	03	39.6	+2.1	15	15	02.0
12 FR	18	04 33	+920	+321.35	03	41.1	+1.5	15	18	58.6
13 SA	18	19 34	+901	+325.80	03	42.1	+1.0	15	22	55.1
14 SU	18	34 17	+883	+330.16	03	42.5	+0.4	15	26	51.7
15 MO	18	48 41	+864	+334.42	03	42.4	-0.1	15	30	48.2
16 TU	19	02 45	+844	+338.59	03	41.7	-0.7	15	34	44.8
17 WE	19	16 31	+826	+342.67	03	40.5	-1.2	15	38	41.3
18 TH	19	29 57	+806	+346.65	03	38.7	-1.8	15	42	37.9
19 FR	19	43 02	+785	+350.53	03	36.4	-2.3	15	46	34.4
20 SA	19	55 48	+766	+354.31	03	33.5	-2.9	15	50	31.0
21 SU	20	08 14	+746	+358.00	03	30.1	-3.4	15	54	27.5
22 MO	20	20 18	+724	+361.57	03	26.2	-3.9	15	58	24.1
23 TU	20	32 02	+704	+365.05	03	21.7	-4.5	16	02	20.7
24 WE	20	43 25	+683	+368.42	03	16.7	-5.0	16	06	17.2
25 TH	20	54 27	+662	+371.69	03	11.2	-5.5	16	10	13.8
26 FR	21	05 07	+640	+374.85	03	05.2	-6.0	16	14	10.4
27 SA	21	15 26	+619	+377.91	02	58.7	-6.5	16	18	06.9
28 SU	21	25 22	+596	+380.85	02	51.6	-7.1	16	22	03.5
29 MO	21	34 56	+574	+383.68	02	44.1	-7.5	16	26	00.0
30 TU	21	44 08	+552	+386.41	02	36.1	-8.0	16	29	56.6
31 WE	21	52 57	+529	+389.02	02	27.7	-8.4	16	33	53.1
			+529	+2.61			-8.4			

Table 2b. Sun, 1989, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS				DAILY CHANGE (SEC)			
	°	'	''	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)		MIN	SEC	HR MIN SEC
JUN 1 TH	22	01	23		+391.52			02	18.8	16 37 49.7
2 FR	22	09	27	+484	+393.91	+2.39	-9.3	02	09.5	16 41 46.2
3 SA	22	17	07	+460	+396.18	+2.27	-9.7	01	59.8	16 45 42.8
4 SU	22	24	23	+436	+398.34	+2.16	-10.0	01	49.8	16 49 39.4
5 MO	22	31	16	+413	+400.38	+2.04	-10.4	01	39.4	16 53 35.9
6 TU	22	37	46	+390	+402.30	+1.92	-10.8	01	28.6	16 57 32.5
7 WE	22	43	51	+365	+404.10	+1.80	-11.0	01	17.6	17 01 29.1
8 TH	22	49	33	+342	+405.79	+1.69	-11.3	01	06.3	17 05 25.6
9 FR	22	54	50	+317	+407.36	+1.57	-11.6	00	54.7	17 09 22.2
10 SA	22	59	44	+294	+408.81	+1.45	-11.8	00	42.9	17 13 18.7
11 SU	23	04	13	+269	+410.14	+1.33	-12.1	00	30.8	17 17 15.3
12 MO	23	08	17	+244	+411.34	+1.20	-12.2	00	18.6	17 21 11.8
13 TU	23	11	57	+220	+412.43	+1.09	-12.3	00	06.3	17 25 08.4
14 WE	23	15	13	+196	+413.40	+0.97	-12.6	-00	06.3	17 29 04.9
15 TH	23	18	04	+171	+414.24	+0.84	-12.6	-00	18.9	17 33 01.5
16 FR	23	20	30	+146	+414.96	+0.72	-12.8	-00	31.7	17 36 58.1
17 SA	23	22	32	+122	+415.57	+0.61	-12.8	-00	44.5	17 40 54.6
18 SU	23	24	09	+97	+416.04	+0.47	-12.9	-00	57.4	17 44 51.2
19 MO	23	25	21	+72	+416.40	+0.36	-13.0	-01	10.4	17 48 47.7
20 TU	23	26	08	+47	+416.63	+0.23	-13.0	-01	23.4	17 52 44.3
21 WE	23	26	31	+23	+416.75	+0.12	-13.0	-01	36.4	17 56 40.9
22 TH	23	26	29	-2	+416.74	-0.01	-12.9	-01	49.3	18 00 37.4
23 FR	23	26	02	-27	+416.60	-0.14	-13.0	-02	02.3	18 04 34.0
24 SA	23	25	11	-51	+416.35	-0.25	-12.9	-02	15.2	18 08 30.5
25 SU	23	23	54	-77	+415.97	-0.38	-12.8	-02	28.0	18 12 27.1
26 MO	23	22	13	-101	+415.47	-0.50	-12.7	-02	40.7	18 16 23.7
27 TU	23	20	07	-126	+414.85	-0.62	-12.6	-02	53.3	18 20 20.2
28 WE	23	17	37	-150	+414.11	-0.74	-12.4	-03	05.7	18 24 16.8
29 TH	23	14	42	-175	+413.24	-0.87	-12.3	-03	18.0	18 28 13.3
30 FR	23	11	22	-200	+412.26	-0.98	-12.1	-03	30.1	18 32 09.9
				-200		-0.98	-12.1			

Table 2b. Sun, 1989, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS		MIN	SEC	DAILY CHANGE (SEC)	HR	MIN	SEC
	°	' "	DAILY CHANGE (SEC)	DAILY CHANGE (MILS)						
JUL 1 SA	23	07 38		+411.15	-03	42.0		18	36	06.4
2 SU	23	03 30	-248	+409.93	-03	53.7	-11.7	18	40	03.0
3 MO	22	58 58	-272	+408.58	-04	05.1	-11.4	18	43	59.6
4 TU	22	54 01	-297	+407.12	-04	16.2	-11.1	18	47	56.1
5 WE	22	48 41	-320	+405.54	-04	26.9	-10.7	18	51	52.7
6 TH	22	42 56	-345	+403.83	-04	37.4	-10.5	18	55	49.3
7 FR	22	36 48	-368	+402.01	-04	47.4	-10.0	18	59	45.8
8 SA	22	30 17	-391	+400.08	-04	57.1	-9.7	19	03	42.4
9 SU	22	23 22	-415	+398.03	-05	06.4	-9.3	19	07	38.9
10 MO	22	16 04	-438	+395.87	-05	15.2	-8.8	19	11	35.5
11 TU	22	08 23	-461	+393.60	-05	23.6	-8.4	19	15	32.0
12 WE	22	00 19	-484	+391.20	-05	31.6	-8.0	19	19	28.6
13 TH	21	51 53	-506	+388.71	-05	39.0	-7.4	19	23	25.1
14 FR	21	43 04	-529	+386.09	-05	46.0	-7.0	19	27	21.7
15 SA	21	33 53	-551	+383.37	-05	52.5	-6.5	19	31	18.3
16 SU	21	24 20	-573	+380.54	-05	58.4	-5.9	19	35	14.8
17 MO	21	14 26	-594	+377.61	-06	03.9	-5.5	19	39	11.4
18 TU	21	04 10	-616	+374.57	-06	08.8	-4.9	19	43	07.9
19 WE	20	53 32	-638	+371.42	-06	13.2	-4.4	19	47	04.5
20 TH	20	42 34	-658	+368.17	-06	17.0	-3.8	19	51	01.1
21 FR	20	31 14	-680	+364.81	-06	20.3	-3.3	19	54	57.6
22 SA	20	19 34	-700	+361.35	-06	23.0	-2.7	19	58	54.2
23 SU	20	07 33	-721	+357.79	-06	25.2	-2.2	20	02	50.7
24 MO	19	55 12	-741	+354.13	-06	26.8	-1.6	20	06	47.3
25 TU	19	42 32	-760	+350.38	-06	27.8	-1.0	20	10	43.8
26 WE	19	29 31	-781	+346.52	-06	28.3	-.5	20	14	40.4
27 TH	19	16 11	-800	+342.57	-06	28.2	+1	20	18	36.9
28 FR	19	02 31	-820	+338.52	-06	27.5	+1.3	20	22	33.5
29 SA	18	48 33	-838	+334.39	-06	26.2	+1.9	20	26	30.1
30 SU	18	34 16	-857	+330.15	-06	24.3	+2.4	20	30	26.6
31 MO	18	19 41	-875	+325.83	-06	21.9	+2.4	20	34	23.2

Table 2b. Sun, 1989, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS				DAILY CHANGE (SEC)			
	°	'	''	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)		MIN	SEC	HR MIN SEC
AUG 1 TU	18	04	47		+321.42			-06	18.8	20 38 19.8
2 WE	17	49	36	-911	+316.92	-4.50	+3.7	-06	15.1	20 42 16.3
3 TH	17	34	08	-928	+312.34	-4.58	+4.2	-06	10.9	20 46 12.9
4 FR	17	18	22	-946	+307.66	-4.68	+4.9	-06	06.0	20 50 09.4
5 SA	17	02	20	-962	+302.91	-4.75	+5.5	-06	00.5	20 54 06.0
6 SU	16	46	01	-979	+298.08	-4.83	+6.1	-05	54.4	20 58 02.5
7 MO	16	29	26	-995	+293.17	-4.91	+6.8	-05	47.6	21 01 59.1
8 TU	16	12	35	-1011	+288.17	-5.00	+7.3	-05	40.3	21 05 55.6
9 WE	15	55	29	-1026	+283.11	-5.06	+7.9	-05	32.4	21 09 52.2
10 TH	15	38	07	-1042	+277.96	-5.15	+8.6	-05	23.8	21 13 48.7
11 FR	15	20	30	-1057	+272.74	-5.22	+9.1	-05	14.7	21 17 45.3
12 SA	15	02	39	-1071	+267.45	-5.29	+9.7	-05	05.0	21 21 41.8
13 SU	14	44	33	-1086	+262.09	-5.36	+10.3	-04	54.7	21 25 38.4
14 MO	14	26	14	-1099	+256.66	-5.43	+10.8	-04	43.9	21 29 35.0
15 TU	14	07	41	-1113	+251.17	-5.49	+11.4	-04	32.5	21 33 31.5
16 WE	13	48	54	-1127	+245.60	-5.57	+12.0	-04	20.5	21 37 28.1
17 TH	13	29	54	-1140	+239.97	-5.63	+12.4	-04	08.1	21 41 24.6
18 FR	13	10	42	-1152	+234.28	-5.69	+13.0	-03	55.1	21 45 21.2
19 SA	12	51	17	-1165	+228.53	-5.75	+13.5	-03	41.6	21 49 17.7
20 SU	12	31	39	-1178	+222.71	-5.82	+14.0	-03	27.6	21 53 14.3
21 MO	12	11	50	-1189	+216.84	-5.87	+14.4	-03	13.2	21 57 10.8
22 TU	11	51	49	-1201	+210.91	-5.93	+14.9	-02	58.3	22 01 07.4
23 WE	11	31	37	-1212	+204.92	-5.99	+15.3	-02	43.0	22 05 03.9
24 TH	11	11	13	-1224	+198.88	-6.04	+15.8	-02	27.2	22 09 00.5
25 FR	10	50	39	-1234	+192.79	-6.09	+16.1	-02	11.1	22 12 57.1
26 SA	10	29	54	-1245	+186.64	-6.15	+16.6	-01	54.5	22 16 53.6
27 SU	10	08	59	-1255	+180.44	-6.20	+16.9	-01	37.6	22 20 50.2
28 MO	09	47	55	-1264	+174.20	-6.24	+17.3	-01	20.3	22 24 46.8
29 TU	09	26	41	-1274	+167.91	-6.29	+17.7	-01	02.6	22 28 43.3
30 WE	09	05	18	-1283	+161.57	-6.34	+18.0	-00	44.6	22 32 39.9
31 TH	08	43	46	-1292	+155.19	-6.38	+18.3	-00	26.3	22 36 36.4
				-1292		-6.38	+18.3			

Table 2b. Sun, 1989, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS		MIN	SEC	DAILY CHANGE (SEC)	HR	MIN	SEC
	°	'	"	DAILY CHANGE (SEC)						
SEP 1 FR	08	22	06							
				-1308	+148.77	-00	07.6		22	40 33.0
2 SA	08	00	18			00	11.3	+18.9	22	44 29.5
				-1316	+142.31			+19.3		
3 SU	07	38	22			00	30.6	+19.5	22	48 26.1
				-1323	+135.81			+19.5		
4 MO	07	16	19			00	50.1	+19.8	22	52 22.6
				-1330	+129.28			+19.8		
5 TU	06	54	09			01	09.9	+20.0	22	56 19.2
				-1337	+122.71			+20.0		
6 WE	06	31	52			01	29.9	+20.3	23	00 15.7
				-1344	+116.11			+20.3		
7 TH	06	09	28			01	50.2	+20.4	23	04 12.3
				-1349	+109.47			+20.4		
8 FR	05	46	59			02	10.6	+20.7	23	08 08.8
				-1355	+102.81			+20.7		
9 SA	05	24	24			02	31.3	+20.8	23	12 05.4
				-1360	+96.12			+20.8		
10 SU	05	01	44			02	52.1	+21.0	23	16 01.9
				-1365	+89.40			+21.0		
11 MO	04	38	59			03	13.1	+21.1	23	19 58.5
				-1370	+82.66			+21.1		
12 TU	04	16	09			03	34.2	+21.3	23	23 55.1
				-1374	+75.90			+21.3		
13 WE	03	53	15			03	55.5	+21.3	23	27 51.6
				-1379	+69.11			+21.3		
14 TH	03	30	16			04	16.8	+21.4	23	31 48.2
				-1382	+62.30			+21.4		
15 FR	03	07	14			04	38.2	+21.5	23	35 44.7
				-1385	+55.48			+21.5		
16 SA	02	44	09			04	59.7	+21.4	23	39 41.3
				-1389	+48.64			+21.4		
17 SU	02	21	00			05	21.1	+21.5	23	43 37.8
				-1392	+41.78			+21.5		
18 MO	01	57	48			05	42.6	+21.4	23	47 34.4
				-1394	+34.90			+21.4		
19 TU	01	34	34			06	04.0	+21.4	23	51 30.9
				-1396	+28.02			+21.4		
20 WE	01	11	18			06	25.4	+21.3	23	55 27.5
				-1399	+21.13			+21.3		
21 TH	00	47	59			06	46.7	+21.3	23	59 24.0
				-1400	+14.22			+21.3		
22 FR	00	24	39			07	08.0	+21.1	00	03 20.6
				-1401	+7.30			+21.1		
23 SA	00	01	18			07	29.1	+20.9	00	07 17.1
				-1403	+3.39			+20.9		
24 SU	-00	22	05			07	50.0	+20.8	00	11 13.7
				-1403	-6.54			+20.8		
25 MO	-00	45	28			08	10.8	+20.7	00	15 10.3
				-1403	-13.47			+20.7		
26 TU	-01	08	51			08	31.5	+20.4	00	19 06.8
				-1403	-20.40			+20.4		
27 WE	-01	32	14			08	51.9	+20.2	00	23 03.4
				-1402	-27.33			+20.2		
28 TH	-01	55	36			09	12.1	+20.0	00	26 59.9
				-1402	-34.25			+20.0		
29 FR	-02	18	58			09	32.1	+19.8	00	30 56.5
				-1400	-41.18			+19.8		
30 SA	-02	42	18			09	51.9	+19.8	00	34 53.0
				-1400	-48.09			+19.8		

Table 2b. Sun, 1989, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS				DAILY CHANGE (SEC)			
	°	'	''	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)		MIN	SEC	HR MIN SEC
OCT 1 SU	-03	05	37	-1396	-55.00	-6.89	+19.2	10	11.4	00 38 49.5
2 MO	-03	28	53	-1395	-61.89	-6.89	+18.9	10	30.6	00 42 46.1
3 TU	-03	52	08	-1391	-68.78	-6.87	+18.6	10	49.5	00 46 42.6
4 WE	-04	15	19	-1388	-75.65	-6.85	+18.3	11	08.1	00 50 39.2
5 TH	-04	38	27	-1385	-82.50	-6.84	+17.9	11	26.4	00 54 35.8
6 FR	-05	01	32	-1381	-89.34	-6.82	+17.5	11	44.3	00 58 32.3
7 SA	-05	24	33	-1377	-96.16	-6.80	+17.2	12	01.8	01 02 28.9
8 SU	-05	47	30	-1372	-102.96	-6.78	+16.7	12	19.0	01 06 25.4
9 MO	-06	10	22	-1367	-109.74	-6.75	+16.4	12	35.7	01 10 22.0
10 TU	-06	33	09	-1362	-116.49	-6.72	+15.9	12	52.1	01 14 18.6
11 WE	-06	55	51	-1356	-123.21	-6.70	+15.4	13	08.0	01 18 15.1
12 TH	-07	18	27	-1350	-129.91	-6.67	+14.9	13	23.4	01 22 11.7
13 FR	-07	40	57	-1344	-136.58	-6.63	+14.4	13	38.3	01 26 08.2
14 SA	-08	03	21	-1337	-143.21	-6.61	+13.9	13	52.7	01 30 04.7
15 SU	-08	25	38	-1329	-149.82	-6.56	+13.4	14	06.6	01 34 01.3
16 MO	-08	47	47	-1323	-156.38	-6.53	+12.7	14	20.0	01 37 57.9
17 TU	-09	09	50	-1314	-162.91	-6.49	+12.2	14	32.7	01 41 54.4
18 WE	-09	31	44	-1307	-169.40	-6.46	+11.5	14	44.9	01 45 51.0
19 TH	-09	53	31	-1298	-175.86	-6.41	+10.9	14	56.4	01 49 47.5
20 FR	-10	15	09	-1289	-182.27	-6.36	+10.3	15	07.3	01 53 44.1
21 SA	-10	36	38	-1280	-188.63	-6.32	+9.5	15	17.6	01 57 40.7
22 SU	-10	57	58	-1270	-194.95	-6.27	+8.9	15	27.1	02 01 37.2
23 MO	-11	19	08	-1260	-201.22	-6.23	+8.2	15	36.0	02 05 33.8
24 TU	-11	40	08	-1250	-207.45	-6.17	+7.5	15	44.2	02 09 30.3
25 WE	-12	00	58	-1238	-213.62	-6.11	+6.7	15	51.7	02 13 26.9
26 TH	-12	21	36	-1227	-219.73	-6.06	+6.0	15	58.4	02 17 23.4
27 FR	-12	42	03	-1215	-225.79	-6.00	+5.3	16	04.4	02 21 20.0
28 SA	-13	02	18	-1204	-231.79	-5.95	+4.5	16	09.7	02 25 16.5
29 SU	-13	22	22	-1190	-237.74	-5.87	+3.7	16	14.2	02 29 13.1
30 MO	-13	42	12	-1177	-243.61	-5.82	+2.9	16	17.9	02 33 09.6
31 TU	-14	01	49	-1177	-249.43	-5.82	+2.9	16	20.8	02 37 06.2

Table 2b. Sun, 1989, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE		APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
		DEGREES		MILS		MIN	SEC	DAILY CHANGE (SEC)	HR	MIN	SEC
		°	' "	MILS	DAILY CHANGE (MILS)						
NOV	1 WE	-14	21 13	-255.18		16	23.0		02	41	02.7
	2 TH	-14	40 23	-260.85	-5.67	16	24.3	+1.3	02	44	59.3
	3 FR	-14	59 19	-266.46	-5.61	16	24.9	+ .6	02	48	55.9
	4 SA	-15	18 00	-272.00	-5.54	16	24.7	- .2	02	52	52.4
	5 SU	-15	36 26	-277.46	-5.46	16	23.7	-1.0	02	56	49.0
	6 MO	-15	54 36	-282.84	-5.38	16	21.8	-1.9	03	00	45.5
	7 TU	-16	12 31	-288.15	-5.31	16	19.2	-2.6	03	04	42.1
	8 WE	-16	30 09	-293.38	-5.23	16	15.7	-3.5	03	08	38.6
	9 TH	-16	47 30	-298.52	-5.14	16	11.4	-4.3	03	12	35.2
	10 FR	-17	04 34	-303.58	-5.06	16	06.3	-5.1	03	16	31.7
	11 SA	-17	21 21	-308.55	-4.97	16	00.3	-6.0	03	20	28.3
	12 SU	-17	37 49	-313.43	-4.88	15	53.5	-6.8	03	24	24.8
	13 MO	-17	54 00	-318.22	-4.79	15	45.9	-7.6	03	28	21.4
	14 TU	-18	09 52	-322.92	-4.70	15	37.4	-8.5	03	32	18.0
	15 WE	-18	25 24	-327.53	-4.61	15	28.1	-9.3	03	36	14.5
	16 TH	-18	40 38	-332.04	-4.51	15	17.9	-10.2	03	40	11.1
	17 FR	-18	55 32	-336.45	-4.41	15	06.9	-11.0	03	44	07.7
	18 SA	-19	10 05	-340.77	-4.32	14	55.0	-11.9	03	48	04.2
	19 SU	-19	24 19	-344.98	-4.21	14	42.3	-12.7	03	52	00.8
	20 MO	-19	38 11	-349.09	-4.11	14	28.7	-13.6	03	55	57.3
	21 TU	-19	51 42	-353.10	-4.01	14	14.3	-14.4	03	59	53.9
	22 WE	-20	04 51	-356.99	-3.89	13	59.0	-15.3	04	03	50.4
	23 TH	-20	17 38	-360.78	-3.79	13	43.0	-16.0	04	07	47.0
	24 FR	-20	30 03	-364.46	-3.68	13	26.1	-16.9	04	11	43.5
	25 SA	-20	42 05	-368.02	-3.56	13	08.5	-17.6	04	15	40.1
	26 SU	-20	53 44	-371.48	-3.46	12	50.1	-18.4	04	19	36.6
	27 MO	-21	05 00	-374.81	-3.33	12	30.9	-19.2	04	23	33.2
	28 TU	-21	15 52	-378.03	-3.22	12	11.0	-19.9	04	27	29.8
	29 WE	-21	26 19	-381.13	-3.10	11	50.4	-20.6	04	31	26.3
	30 TH	-21	36 23	-384.11	-2.98	11	29.1	-21.3	04	35	22.9
				-604	-2.98			-21.3			

Table 2b. Sun, 1989, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME			
	DEGREES		DAILY CHANGE (SEC)	MILS		MIN	SEC	DAILY CHANGE (SEC)	HR	MIN	SEC
	°	'		''	MILS						
DEC 1 FR	-21	46	01		-386.97			11 07.1			04 39 19.5
2 SA	-21	55	15	-554	-389.70	-2.73			-22.6		04 43 16.0
3 SU	-22	04	03	-528	-392.31	-2.61		10 44.5	-23.2		04 47 12.6
4 MO	-22	12	25	-502	-394.79	-2.48		10 21.3	-23.8		04 47 12.6
5 TU	-22	20	22	-477	-397.15	-2.36		09 57.5	-24.4		04 51 09.1
6 WE	-22	27	53	-451	-399.37	-2.22		09 33.1	-24.9		04 55 05.7
7 TH	-22	34	58	-425	-399.37	-2.10		09 08.2	-25.4		04 59 02.3
8 FR	-22	41	35	-397	-401.47	-1.96		08 42.8	-25.9		05 02 58.8
9 SA	-22	47	47	-372	-403.43	-1.84		08 16.9	-26.4		05 06 55.4
10 SU	-22	53	31	-344	-405.27	-1.70		07 50.5	-26.8		05 10 51.9
11 MO	-22	58	48	-317	-406.97	-1.56		07 23.7	-27.2		05 14 48.5
12 TU	-23	03	38	-290	-408.53	-1.44		06 56.5	-27.6		05 18 45.0
13 WE	-23	08	01	-263	-409.97	-1.29		06 28.9	-27.9		05 22 41.6
14 TH	-23	11	56	-235	-411.26	-1.16		06 01.0	-28.3		05 26 38.2
15 FR	-23	15	24	-208	-412.42	-1.03		05 32.7	-28.6		05 30 34.7
16 SA	-23	18	24	-180	-413.45	-.89		05 04.1	-28.9		05 34 31.3
17 SU	-23	20	55	-151	-414.34	-.75		04 35.2	-29.1		05 38 27.9
18 MO	-23	22	59	-124	-415.09	-.61		04 06.1	-29.3		05 42 24.4
19 TU	-23	24	35	-96	-415.70	-.47		03 36.8	-29.5		05 46 21.0
20 WE	-23	25	43	-68	-416.17	-.34		03 07.3	-29.7		05 50 17.5
21 TH	-23	26	22	-39	-416.51	-.19		02 37.6	-29.8		05 54 14.1
22 FR	-23	26	33	-11	-416.70	-.06		02 07.8	-29.8		05 58 10.6
23 SA	-23	26	16	+17	-416.76	+.09		01 38.0	-30.0		06 02 07.2
24 SU	-23	26	16	+46	-416.67	+.23		01 08.0	-29.9		06 06 03.7
25 MO	-23	25	30	+74	-416.44	+.36		00 38.1	-29.9		06 10 00.3
26 TU	-23	24	16	+102	-416.08	+.50		00 08.2	-29.9		06 13 56.9
27 WE	-23	22	34	+130	-415.58	+.65		-00 21.7	-29.7		06 17 53.4
28 TH	-23	20	24	+158	-414.93	+.78		-00 51.4	-29.6		06 21 50.0
29 FR	-23	17	46	+187	-414.15	+.92		-01 21.0	-29.5		06 25 46.5
30 SA	-23	14	39	+214	-413.23	+1.06		-01 50.5	-29.2		06 29 43.1
31 SU	-23	11	05	+243	-412.17	+1.20		-02 19.7	-29.0		06 33 39.7
32 MO	-23	07	02	+270	-410.97	+1.33		-02 48.7	-28.7		06 37 36.2
	-23	02	32		-409.64			-03 17.4			06 41 32.8

Table 2c. Sun, 1990, for Zero Hours Universal Time (GMT)

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS				DAILY CHANGE [SEC]			
	°	'	''	DAILY CHANGE [SEC]	MILS	DAILY CHANGE [MILS]		MIN	SEC	HR MIN SEC
JAN 0 SU	-23	07	02		-410.97			-02	48.7	06 37 36.2
JAN 1 MO	-23	02	32	+270	-409.64	+1.33	-28.7	-03	17.4	06 41 32.8
2 TU	-22	57	34	+298	-408.17	+1.47	-28.3	-03	45.7	06 45 29.3
3 WE	-22	52	09	+325	-406.56	+1.61	-28.1	-04	13.8	06 49 25.9
4 TH	-22	46	17	+352	-404.82	+1.74	-27.6	-04	41.4	06 53 22.4
5 FR	-22	39	57	+380	-402.95	+1.87	-27.2	-05	08.6	06 57 19.0
6 SA	-22	33	11	+406	-400.94	+2.01	-26.8	-05	35.4	07 01 15.6
7 SU	-22	25	58	+433	-398.80	+2.14	-26.3	-06	01.7	07 05 12.1
8 MO	-22	18	18	+460	-396.53	+2.27	-25.8	-06	27.5	07 09 08.7
9 TU	-22	10	12	+486	-394.13	+2.40	-25.3	-06	52.8	07 13 05.2
10 WE	-22	01	41	+511	-391.61	+2.52	-24.7	-07	17.5	07 17 01.8
11 TH	-21	52	43	+538	-388.95	+2.66	-24.2	-07	41.7	07 20 58.4
12 FR	-21	43	20	+563	-386.17	+2.78	-23.6	-08	05.3	07 24 54.9
13 SA	-21	33	32	+588	-383.27	+2.90	-23.0	-08	28.3	07 28 51.5
14 SU	-21	23	19	+613	-380.24	+3.03	-22.4	-08	50.7	07 32 48.1
15 MO	-21	12	41	+638	-377.09	+3.15	-21.7	-09	12.4	07 36 44.6
16 TU	-21	01	38	+663	-373.82	+3.27	-21.2	-09	33.6	07 40 41.2
17 WE	-20	50	12	+686	-370.43	+3.39	-20.4	-09	54.0	07 44 37.7
18 TH	-20	38	21	+711	-366.92	+3.51	-19.8	-10	13.8	07 48 34.3
19 FR	-20	26	07	+734	-363.29	+3.63	-19.0	-10	32.8	07 52 30.8
20 SA	-20	13	30	+757	-359.56	+3.73	-18.4	-10	51.2	07 56 27.4
21 SU	-20	00	30	+780	-355.70	+3.86	-17.6	-11	08.8	08 00 23.9
22 MO	-19	47	07	+803	-351.74	+3.96	-16.9	-11	25.7	08 04 20.5
23 TU	-19	33	22	+825	-347.66	+4.08	-16.2	-11	41.9	08 08 17.1
24 WE	-19	19	15	+847	-343.48	+4.18	-15.3	-11	57.2	08 12 13.6
25 TH	-19	04	47	+868	-339.20	+4.28	-14.7	-12	11.9	08 16 10.2
26 FR	-18	49	58	+889	-334.80	+4.40	-13.8	-12	25.7	08 20 06.7
27 SA	-18	34	48	+910	-330.31	+4.49	-13.0	-12	38.7	08 24 03.3
28 SU	-18	19	18	+930	-325.72	+4.59	-12.2	-12	50.9	08 27 59.9
29 MO	-18	03	28	+950	-321.03	+4.69	-11.4	-13	02.3	08 31 56.4
30 TU	-17	47	19	+969	-316.24	+4.79	-10.6	-13	12.9	08 35 53.0
31 WE	-17	30	51	+988	-311.36	+4.88	-9.7	-13	22.6	08 39 49.5
				+988		+4.88	-9.7			

Table 2c. Sun, 1990, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS				DAILY CHANGE (SEC)			
	°	'	"	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)		MIN	SEC	HR MIN SEC
FEB 1 TH	-17	14	04		-306.39			-13	31.5	08 43 46.1
2 FR	-16	56	59	+1025	-301.33	+5.06	-8.1	-13	39.6	08 47 42.6
3 SA	-16	39	36	+1043	-296.18	+5.15	-7.2	-13	46.8	08 51 39.2
4 SU	-16	21	56	+1060	-290.94	+5.24	-6.4	-13	53.2	08 55 35.7
5 MO	-16	03	59	+1077	-285.62	+5.32	-5.6	-13	58.8	08 59 32.3
6 TU	-15	45	46	+1093	-280.23	+5.39	-4.8	-14	03.6	09 03 28.9
7 WE	-15	27	17	+1109	-274.75	+5.48	-3.9	-14	07.5	09 07 25.4
8 TH	-15	08	31	+1126	-269.19	+5.56	-3.1	-14	10.6	09 11 22.0
9 FR	-14	49	31	+1140	-263.56	+5.63	-2.3	-14	12.9	09 15 18.5
10 SA	-14	30	16	+1155	-257.86	+5.70	-1.5	-14	14.4	09 19 15.1
11 SU	-14	10	46	+1170	-252.08	+5.78	-.8	-14	15.2	09 23 11.7
12 MO	-13	51	02	+1184	-246.23	+5.85	+1.1	-14	15.1	09 27 08.2
13 TU	-13	31	04	+1198	-240.32	+5.91	+1.8	-14	14.3	09 31 04.7
14 WE	-13	10	53	+1211	-234.34	+5.98	+1.5	-14	12.8	09 35 01.3
15 TH	-12	50	29	+1224	-228.29	+6.05	+2.2	-14	10.6	09 38 57.8
16 FR	-12	29	52	+1237	-222.18	+6.11	+3.0	-14	07.6	09 42 54.4
17 SA	-12	09	03	+1249	-216.01	+6.17	+3.7	-14	03.9	09 46 51.0
18 SU	-11	48	03	+1260	-209.79	+6.22	+4.3	-13	59.6	09 50 47.5
19 MO	-11	26	51	+1272	-203.51	+6.28	+5.0	-13	54.6	09 54 44.1
20 TU	-11	05	28	+1283	-197.18	+6.33	+5.7	-13	48.9	09 58 40.6
21 WE	-10	43	55	+1293	-190.79	+6.39	+6.4	-13	42.5	10 02 37.2
22 TH	-10	22	11	+1304	-184.35	+6.44	+7.0	-13	35.5	10 06 33.7
23 FR	-10	00	18	+1313	-177.87	+6.48	+7.6	-13	27.9	10 10 30.3
24 SA	-09	38	16	+1322	-171.34	+6.53	+8.2	-13	19.7	10 14 26.9
25 SU	-09	16	05	+1331	-164.77	+6.57	+8.8	-13	10.9	10 18 23.4
26 MO	-08	53	46	+1339	-158.15	+6.62	+9.4	-13	01.5	10 22 20.0
27 TU	-08	31	19	+1347	-151.50	+6.65	+9.9	-12	51.6	10 26 16.5
28 WE	-08	08	44	+1355	-144.81	+6.69	+10.5	-12	41.1	10 30 13.1
				+1355		+6.69	+10.5			

Table 2c. Sun, 1990, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS				DAILY CHANGE (SEC)			
	°	'	''	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)		MIN	SEC	HR MIN SEC
MAR 1 TH	-07	46	02		-138.08			-12	30.0	10 34 09.6
2 FR	-07	23	14	+1368	-131.33	+6.75	+11.6	-12	18.4	10 38 06.2
3 SA	-07	00	19	+1375	-124.54	+6.79	+12.1	-12	06.3	10 42 02.7
4 SU	-06	37	19	+1380	-117.72	+6.82	+12.6	-11	53.7	10 45 59.3
5 MO	-06	14	13	+1386	-110.88	+6.84	+13.1	-11	40.6	10 49 55.8
6 TU	-05	51	02	+1391	-104.01	+6.87	+13.6	-11	27.0	10 53 52.4
7 WE	-05	27	46	+1396	-97.12	+6.89	+14.0	-11	13.0	10 57 49.0
8 TH	-05	04	27	+1399	-90.21	+6.91	+14.4	-10	58.6	11 01 45.5
9 FR	-04	41	03	+1404	-83.27	+6.94	+14.8	-10	43.8	11 05 42.1
10 SA	-04	17	36	+1407	-76.33	+6.94	+15.2	-10	28.6	11 09 38.6
11 SU	-03	54	05	+1411	-69.36	+6.97	+15.5	-10	13.1	11 13 35.2
12 MO	-03	30	32	+1413	-62.38	+6.98	+15.8	-09	57.3	11 17 31.7
13 TU	-03	06	56	+1416	-55.39	+6.99	+16.2	-09	41.1	11 21 28.3
14 WE	-02	43	18	+1418	-48.39	+7.00	+16.4	-09	24.7	11 25 24.8
15 TH	-02	19	38	+1420	-41.37	+7.02	+16.7	-09	08.0	11 29 21.4
16 FR	-01	55	57	+1421	-34.36	+7.01	+16.9	-08	51.1	11 33 17.9
17 SA	-01	32	15	+1422	-27.33	+7.03	+17.2	-08	33.9	11 37 14.5
18 SU	-01	08	32	+1423	-20.31	+7.02	+17.3	-08	16.6	11 41 11.0
19 MO	-00	44	48	+1424	-13.27	+7.04	+17.5	-07	59.1	11 45 07.6
20 TU	-00	21	05	+1423	-6.25	+7.02	+17.6	-07	41.5	11 49 04.1
21 WE	00	02	39	+1424	+7.79	+7.04	+17.8	-07	23.7	11 53 00.7
22 TH	00	26	21	+1422	+7.81	+7.02	+17.8	-07	05.9	11 56 57.3
23 FR	00	50	02	+1421	+14.82	+7.01	+18.0	-06	47.9	12 00 53.8
24 SA	01	13	42	+1420	+21.84	+7.02	+18.0	-06	29.9	12 04 50.4
25 SU	01	37	20	+1418	+28.84	+7.00	+18.1	-06	11.8	12 08 46.9
26 MO	02	00	56	+1416	+35.83	+6.99	+18.1	-05	53.7	12 12 43.5
27 TU	02	24	29	+1413	+42.81	+6.98	+18.1	-05	35.6	12 16 40.0
28 WE	02	47	59	+1410	+49.77	+6.96	+18.1	-05	17.5	12 20 36.6
29 TH	03	11	26	+1407	+56.72	+6.95	+18.1	-04	59.4	12 24 33.1
30 FR	03	34	49	+1403	+63.65	+6.93	+18.0	-04	41.4	12 28 29.7
31 SA	03	58	08	+1399	+70.56	+6.91	+18.1	-04	23.3	12 32 26.2
				+1399		+6.91	+18.1			

Table 2c. Sun, 1990, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS		MIN	SEC	DAILY CHANGE (SEC)	HR	MIN	SEC
	°	' "	DAILY CHANGE (SEC)	DAILY CHANGE (MILS)						
APR 1 SU	04	21 22		+77.44	-04	05.4		12	36	22.8
2 MO	04	44 31	+1389	+84.30	+6.86	-03	47.5	+17.9	12	40 19.3
3 TU	05	07 35	+1384	+91.14	+6.84	-03	29.8	+17.7	12	44 15.9
4 WE	05	30 34	+1379	+97.95	+6.81	-03	12.1	+17.7	12	48 12.5
5 TH	05	53 27	+1373	+104.73	+6.78	-02	54.6	+17.5	12	52 09.0
6 FR	06	16 13	+1366	+111.47	+6.74	-02	37.2	+17.4	12	56 05.6
7 SA	06	38 53	+1360	+118.19	+6.72	-02	20.1	+17.1	13	00 02.1
8 SU	07	01 26	+1353	+124.87	+6.68	-02	03.1	+17.0	13	03 58.7
9 MO	07	23 51	+1345	+131.51	+6.64	-01	46.4	+16.7	13	07 55.2
10 TU	07	46 10	+1339	+138.12	+6.61	-01	29.8	+16.6	13	11 51.8
11 WE	08	08 20	+1330	+144.69	+6.57	-01	13.6	+16.2	13	15 48.3
12 TH	08	30 22	+1322	+151.22	+6.53	-00	57.6	+16.0	13	19 44.9
13 FR	08	52 16	+1314	+157.71	+6.49	-00	42.0	+15.6	13	23 41.4
14 SA	09	14 01	+1305	+164.15	+6.44	-00	26.6	+15.4	13	27 38.0
15 SU	09	35 37	+1296	+170.55	+6.40	-00	11.6	+15.0	13	31 34.5
16 MO	09	57 04	+1287	+176.91	+6.36	00	03.0	+14.6	13	35 31.1
17 TU	10	18 21	+1277	+183.21	+6.30	00	17.3	+14.3	13	39 27.6
18 WE	10	39 27	+1266	+189.47	+6.26	00	31.1	+13.8	13	43 24.2
19 TH	11	00 24	+1257	+195.67	+6.20	00	44.6	+13.5	13	47 20.8
20 FR	11	21 09	+1245	+201.82	+6.15	00	57.6	+13.0	13	51 17.3
21 SA	11	41 43	+1234	+207.92	+6.10	01	10.3	+12.7	13	55 13.9
22 SU	12	02 06	+1223	+213.96	+6.04	01	22.4	+12.1	13	59 10.4
23 MO	12	22 17	+1211	+219.94	+5.98	01	34.1	+11.7	14	03 07.0
24 TU	12	42 16	+1199	+225.86	+5.92	01	45.4	+11.3	14	07 03.5
25 WE	13	02 02	+1186	+231.71	+5.85	01	56.1	+10.7	14	11 00.1
26 TH	13	21 36	+1174	+237.51	+5.80	02	06.4	+10.3	14	14 56.6
27 FR	13	40 56	+1160	+243.24	+5.73	02	16.2	+9.8	14	18 53.2
28 SA	14	00 02	+1146	+248.90	+5.66	02	25.5	+9.3	14	22 49.7
29 SU	14	18 55	+1133	+254.49	+5.59	02	34.3	+8.8	14	26 46.3
30 MO	14	37 33	+1118	+260.01	+5.52	02	42.6	+8.3	14	30 42.9
			+1118		+5.52			+8.3		

Table 2c. Sun, 1990, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME			
	DEGREES		DAILY CHANGE (SEC)	MILS		MIN	SEC	DAILY CHANGE (SEC)	HR	MIN	SEC
	°	' "		MILS	DAILY CHANGE (MILS)						
MAY 1 TU	14	55 57		+265.47		02	50.4		14	34	39.4
2 WE	15	14 06	+1089	+270.84	+5.37	02	57.7	+7.3	14	38	36.0
3 TH	15	32 00	+1074	+276.15	+5.31	03	04.4	+6.7	14	42	32.5
4 FR	15	49 38	+1058	+281.37	+5.22	03	10.7	+6.3	14	46	29.1
5 SA	16	07 00	+1042	+286.52	+5.15	03	16.4	+5.7	14	50	25.6
6 SU	16	24 07	+1027	+291.59	+5.07	03	21.5	+5.1	14	54	22.2
7 MO	16	40 57	+1010	+296.58	+4.99	03	26.1	+4.6	14	58	18.7
8 TU	16	57 30	+993	+301.48	+4.90	03	30.2	+4.1	15	02	15.3
9 WE	17	13 46	+976	+306.30	+4.82	03	33.7	+3.5	15	06	11.8
10 TH	17	29 45	+959	+311.04	+4.74	03	36.6	+2.9	15	10	08.4
11 FR	17	45 26	+941	+315.68	+4.64	03	38.9	+2.3	15	14	05.0
12 SA	18	00 50	+924	+320.25	+4.57	03	40.7	+1.8	15	18	01.5
13 SU	18	15 56	+906	+324.72	+4.47	03	41.9	+1.2	15	21	58.1
14 MO	18	30 43	+887	+329.10	+4.38	03	42.5	+0.6	15	25	54.6
15 TU	18	45 12	+869	+333.39	+4.29	03	42.5	+0.0	15	29	51.2
16 WE	18	59 22	+850	+337.59	+4.20	03	42.0	-0.5	15	33	47.8
17 TH	19	13 12	+830	+341.69	+4.10	03	40.8	-1.2	15	37	44.3
18 FR	19	26 43	+811	+345.69	+4.00	03	39.1	-1.7	15	41	40.9
19 SA	19	39 54	+791	+349.60	+3.91	03	36.8	-2.3	15	45	37.4
20 SU	19	52 46	+772	+353.41	+3.81	03	34.0	-2.8	15	49	34.0
21 MO	20	05 16	+750	+357.12	+3.71	03	30.5	-3.5	15	53	30.5
22 TU	20	17 27	+731	+360.73	+3.61	03	26.5	-4.0	15	57	27.1
23 WE	20	29 16	+709	+364.23	+3.50	03	22.0	-4.5	16	01	23.6
24 TH	20	40 44	+688	+367.62	+3.39	03	16.9	-5.1	16	05	20.2
25 FR	20	51 51	+667	+370.92	+3.30	03	11.3	-5.6	16	09	16.8
26 SA	21	02 37	+646	+374.11	+3.19	03	05.3	-6.0	16	13	13.3
27 SU	21	13 01	+624	+377.19	+3.08	02	58.7	-6.6	16	17	09.9
28 MO	21	23 02	+601	+380.16	+2.97	02	51.7	-7.0	16	21	06.5
29 TU	21	32 42	+580	+383.02	+2.86	02	44.2	-7.5	16	25	03.0
30 WE	21	41 58	+556	+385.77	+2.75	02	36.3	-7.9	16	28	59.6
31 TH	21	50 53	+535	+388.41	+2.64	02	28.0	-8.3	16	32	56.1
			+535		+2.64			-8.3			

Table 2c. Sun, 1990, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME		SIDEREAL TIME				
	DEGREES		MILS		MIN	SEC	DAILY CHANGE (SEC)	HR	MIN	SEC	
	°	' "	DAILY CHANGE (SEC)	MILS							DAILY CHANGE (MILS)
JUN 1 FR	21	59 24		+390.93		02	19.3		16	36	52.7
2 SA	22	07 32	+488	+393.34	+2.41	02	10.1	-9.2	16	40	49.2
3 SU	22	15 18	+466	+395.64	+2.30	02	00.7	-9.4	16	44	45.8
4 MO	22	22 39	+441	+397.82	+2.18	01	50.8	-9.9	16	48	42.3
5 TU	22	29 38	+419	+399.89	+2.07	01	40.7	-10.1	16	52	38.9
6 WE	22	36 13	+395	+401.84	+1.95	01	30.2	-10.5	16	56	35.4
7 TH	22	42 24	+371	+403.67	+1.83	01	19.4	-10.8	17	00	32.0
8 FR	22	48 11	+347	+405.39	+1.72	01	08.2	-11.2	17	04	28.6
9 SA	22	53 34	+323	+406.98	+1.59	00	56.9	-11.3	17	08	25.1
10 SU	22	58 33	+299	+408.46	+1.48	00	45.2	-11.7	17	12	21.7
11 MO	23	03 08	+275	+409.82	+1.36	00	33.4	-11.8	17	16	18.3
12 TU	23	07 19	+251	+411.06	+1.24	00	21.3	-12.1	17	20	14.8
13 WE	23	11 05	+226	+412.17	+1.11	00	09.0	-12.3	17	24	11.4
14 TH	23	14 27	+202	+413.17	+1.00	-00	03.5	-12.5	17	28	07.9
15 FR	23	17 24	+177	+414.04	+0.87	-00	16.2	-12.7	17	32	04.5
16 SA	23	19 56	+152	+414.80	+0.76	-00	29.0	-12.8	17	36	01.0
17 SU	23	22 04	+128	+415.43	+0.63	-00	41.9	-12.9	17	39	57.6
18 MO	23	23 47	+103	+415.94	+0.51	-00	55.0	-13.1	17	43	54.1
19 TU	23	25 05	+78	+416.32	+0.38	-01	08.1	-13.1	17	47	50.7
20 WE	23	25 58	+53	+416.58	+0.26	-01	21.2	-13.1	17	51	47.3
21 TH	23	26 26	+28	+416.72	+0.14	-01	34.4	-13.2	17	55	43.8
22 FR	23	26 30	+4	+416.74	+0.02	-01	47.6	-13.2	17	59	40.4
23 SA	23	26 09	-21	+416.64	-0.10	-02	00.7	-13.1	18	03	37.0
24 SU	23	25 23	-46	+416.41	-0.23	-02	13.8	-13.1	18	07	33.5
25 MO	23	24 12	-71	+416.06	-0.35	-02	26.8	-13.0	18	11	30.1
26 TU	23	22 36	-96	+415.59	-0.47	-02	39.6	-12.8	18	15	26.6
27 WE	23	20 36	-120	+414.99	-0.60	-02	52.3	-12.7	18	19	23.2
28 TH	23	18 11	-145	+414.28	-0.71	-03	04.9	-12.6	18	23	19.8
29 FR	23	15 22	-169	+413.44	-0.84	-03	17.2	-12.3	18	27	16.3
30 SA	23	12 08	-194	+412.48	-0.96	-03	29.3	-12.1	18	31	12.9
			-194		-0.96			-12.1			

Table 2c. Sun, 1990, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS				DAILY CHANGE {SEC}			
	°	'	"	DAILY CHANGE {SEC}	MILS	DAILY CHANGE {MILS}		MIN	SEC	HR MIN SEC
JUL 1 SU	23	08	30		+411.41			-03	41.2	18 35 09.4
2 MO	23	04	27	-243	+410.21	-1.20	-11.6	-03	52.8	18 39 06.0
3 TU	23	00	00	-267	+408.89	-1.32	-11.3	-04	04.1	18 43 02.5
4 WE	22	55	10	-290	+407.46	-1.43	-11.0	-04	15.1	18 46 59.1
5 TH	22	49	55	-315	+405.90	-1.56	-10.7	-04	25.8	18 50 55.6
6 FR	22	44	17	-338	+404.23	-1.67	-10.3	-04	36.1	18 54 52.2
7 SA	22	38	15	-362	+402.44	-1.79	-10.0	-04	46.1	18 58 48.8
8 SU	22	31	49	-386	+400.54	-1.90	-9.7	-04	55.8	19 02 45.3
9 MO	22	25	01	-408	+398.52	-2.02	-9.2	-05	05.0	19 06 41.9
10 TU	22	17	49	-432	+396.39	-2.13	-8.8	-05	13.8	19 10 38.5
11 WE	22	10	13	-456	+394.14	-2.25	-8.5	-05	22.3	19 14 35.0
12 TH	22	02	16	-477	+391.78	-2.36	-8.0	-05	30.3	19 18 31.6
13 FR	21	53	55	-501	+389.31	-2.47	-7.5	-05	37.8	19 22 28.1
14 SA	21	45	12	-523	+386.73	-2.58	-7.1	-05	44.9	19 26 24.7
15 SU	21	36	06	-546	+384.03	-2.70	-6.7	-05	51.6	19 30 21.2
16 MO	21	26	38	-568	+381.22	-2.81	-6.1	-05	57.7	19 34 17.8
17 TU	21	16	48	-590	+378.31	-2.91	-5.7	-06	03.4	19 38 14.3
18 WE	21	06	37	-611	+375.29	-3.02	-5.2	-06	08.6	19 42 10.9
19 TH	20	56	04	-633	+372.17	-3.12	-4.6	-06	13.2	19 46 07.5
20 FR	20	45	09	-655	+368.93	-3.24	-4.2	-06	17.4	19 50 04.0
21 SA	20	33	54	-675	+365.60	-3.33	-3.6	-06	21.0	19 54 00.6
22 SU	20	22	18	-696	+362.16	-3.44	-3.0	-06	24.0	19 57 57.2
23 MO	20	10	21	-717	+358.62	-3.54	-2.5	-06	26.5	20 01 53.7
24 TU	19	58	04	-737	+354.98	-3.64	-1.8	-06	28.3	20 05 50.3
25 WE	19	45	28	-756	+351.25	-3.73	-1.3	-06	29.6	20 09 46.8
26 TH	19	32	31	-777	+347.41	-3.84	-.7	-06	30.3	20 13 43.4
27 FR	19	19	15	-796	+343.48	-3.93	-.1	-06	30.4	20 17 39.9
28 SA	19	05	40	-815	+339.46	-4.02	+.6	-06	29.8	20 21 36.5
29 SU	18	51	46	-834	+335.34	-4.12	+1.1	-06	28.7	20 25 33.0
30 MO	18	37	34	-852	+331.13	-4.21	+1.8	-06	26.9	20 29 29.6
31 TU	18	23	03	-871	+326.83	-4.30	+2.4	-06	24.5	20 33 26.1
				-871		-4.30	+2.4			

Table 2c. Sun, 1990, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION					EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		DAILY CHANGE (SEC)	MILS		MIN	SEC	DAILY CHANGE (SEC)	HR	MIN	SEC
	°	' "		MILS	DAILY CHANGE (MILS)						
AUG 1 WE	18	08 15		+322.44		-06	21.4		20	37	22.7
2 TH	17	53 09	-906	+317.97	-4.47	-06	17.8	+3.6	20	41	19.3
3 FR	17	37 45	-924	+313.41	-4.56	-06	13.5	+4.3	20	45	15.8
4 SA	17	22 04	-941	+308.76	-4.65	-06	08.6	+4.9	20	49	12.4
5 SU	17	06 07	-957	+304.03	-4.73	-06	03.1	+5.5	20	53	08.9
6 MO	16	49 53	-974	+299.22	-4.81	-05	57.0	+6.1	20	57	05.5
7 TU	16	33 22	-991	+294.33	-4.89	-05	50.3	+6.7	21	01	02.1
8 WE	16	16 36	-1006	+289.36	-4.97	-05	43.0	+7.3	21	04	58.6
9 TH	15	59 34	-1022	+284.32	-5.04	-05	35.1	+7.9	21	08	55.2
10 FR	15	42 16	-1038	+279.19	-5.13	-05	26.6	+8.5	21	12	51.7
11 SA	15	24 43	-1053	+273.99	-5.20	-05	17.6	+9.0	21	16	48.3
12 SU	15	06 56	-1067	+268.72	-5.27	-05	08.0	+9.6	21	20	44.8
13 MO	14	48 53	-1083	+263.37	-5.35	-04	57.9	+10.1	21	24	41.4
14 TU	14	30 37	-1096	+257.96	-5.41	-04	47.2	+10.7	21	28	37.9
15 WE	14	12 06	-1111	+252.47	-5.49	-04	36.0	+11.2	21	32	34.5
16 TH	13	53 22	-1124	+246.92	-5.55	-04	24.3	+11.7	21	36	31.0
17 FR	13	34 24	-1138	+241.30	-5.62	-04	12.1	+12.2	21	40	27.6
18 SA	13	15 14	-1150	+235.62	-5.68	-03	59.4	+12.7	21	44	24.2
19 SU	12	55 50	-1164	+229.88	-5.74	-03	46.2	+13.2	21	48	20.7
20 MO	12	36 15	-1175	+224.07	-5.81	-03	32.5	+13.7	21	52	17.3
21 TU	12	16 27	-1188	+218.21	-5.86	-03	18.3	+14.2	21	56	13.8
22 WE	11	56 28	-1199	+212.29	-5.92	-03	03.6	+14.7	22	00	10.4
23 TH	11	36 18	-1210	+206.31	-5.98	-02	48.5	+15.1	22	04	06.9
24 FR	11	15 56	-1222	+200.28	-6.03	-02	33.0	+15.5	22	08	03.5
25 SA	10	55 24	-1232	+194.19	-6.09	-02	17.0	+16.0	22	12	00.0
26 SU	10	34 42	-1242	+188.06	-6.13	-02	00.5	+16.5	22	15	56.6
27 MO	10	13 50	-1252	+181.88	-6.18	-01	43.7	+16.8	22	19	53.1
28 TU	09	52 48	-1262	+175.64	-6.24	-01	26.4	+17.3	22	23	49.7
29 WE	09	31 37	-1271	+169.37	-6.27	-01	08.8	+17.6	22	27	46.2
30 TH	09	10 17	-1280	+163.05	-6.32	-00	50.7	+18.1	22	31	42.8
31 FR	08	48 48	-1289	+156.68	-6.37	-00	32.4	+18.3	22	35	39.4
			-1289		-6.37			+18.3			

Table 2c. Sun, 1990, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS		MIN	SEC	DAILY CHANGE (SEC)	HR	MIN	SEC
	°	' "	DAILY CHANGE (SEC)	DAILY CHANGE (MILS)						
SEP 1 SA	08	27 11		+150.28	-00	13.7		22	39	35.9
2 SU	08	05 25	-1306	+143.83	00	05.4	+19.1	22	43	32.5
3 MO	07	43 32	-1313	+137.34	00	24.7	+19.3	22	47	29.0
4 TU	07	21 32	-1320	+130.82	00	44.3	+19.6	22	51	25.6
5 WE	06	59 25	-1327	+124.27	01	04.2	+19.9	22	55	22.1
6 TH	06	37 10	-1335	+117.68	01	24.3	+20.1	22	59	18.7
7 FR	06	14 50	-1340	+111.06	01	44.6	+20.3	23	03	15.2
8 SA	05	52 22	-1348	+104.40	02	05.1	+20.5	23	07	11.8
9 SU	05	29 49	-1353	+97.72	02	25.8	+20.7	23	11	08.3
10 MO	05	07 11	-1358	+91.02	02	46.6	+20.8	23	15	04.9
11 TU	04	44 26	-1365	+84.28	03	07.6	+21.0	23	19	01.4
12 WE	04	21 37	-1369	+77.52	03	28.7	+21.1	23	22	58.0
13 TH	03	58 43	-1374	+70.73	03	49.8	+21.1	23	26	54.6
14 FR	03	35 45	-1378	+63.93	04	11.0	+21.2	23	30	51.1
15 SA	03	12 43	-1382	+57.10	04	32.3	+21.3	23	34	47.7
16 SU	02	49 37	-1386	+50.26	04	53.6	+21.3	23	38	44.2
17 MO	02	26 28	-1389	+43.40	05	14.9	+21.3	23	42	40.8
18 TU	02	03 16	-1392	+36.52	05	36.3	+21.4	23	46	37.3
19 WE	01	40 01	-1395	+29.63	05	57.6	+21.3	23	50	33.9
20 TH	01	16 44	-1397	+22.74	06	18.8	+21.2	23	54	30.4
21 FR	00	53 25	-1399	+15.83	06	40.1	+21.3	23	58	27.0
22 SA	00	30 05	-1400	+8.91	07	01.2	+21.1	00	02	23.5
23 SU	00	06 44	-1401	+2.00	07	22.3	+21.1	00	06	20.1
24 MO	-00	16 38	-1402	-4.93	07	43.3	+21.0	00	10	16.6
25 TU	-00	40 01	-1403	-11.86	08	04.1	+20.8	00	14	13.2
26 WE	-01	03 24	-1403	-18.79	08	24.8	+20.7	00	18	09.7
27 TH	-01	26 46	-1402	-25.71	08	45.3	+20.5	00	22	06.3
28 FR	-01	50 08	-1402	-32.63	09	05.7	+20.4	00	26	02.9
29 SA	-02	13 29	-1401	-39.55	09	25.9	+20.2	00	29	59.4
30 SU	-02	36 48	-1399	-46.46	09	45.8	+19.9	00	33	56.0
			-1399	-6.91			+19.9			

Table 2c. Sun, 1990, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS				DAILY CHANGE (SEC)			
	°	'	"					HR	MIN	SEC
OCT 1 MO	-03	00	06	-53.36		10 05.5		00	37	52.5
2 TU	-03	23	22	-1396	-60.26	-6.90	+19.5	00	41	49.1
3 WE	-03	46	36	-1394	-67.14	-6.88	+19.1	00	45	45.6
4 TH	-04	09	46	-1390	-74.00	-6.86	+18.8	00	49	42.2
5 FR	-04	32	55	-1389	-80.86	-6.86	+18.5	00	53	38.7
6 SA	-04	55	59	-1384	-87.70	-6.84	+18.2	00	57	35.3
7 SU	-05	19	00	-1381	-94.52	-6.82	+17.7	01	01	31.8
8 MO	-05	41	58	-1378	-101.32	-6.80	+17.4	01	05	28.4
9 TU	-06	04	51	-1373	-108.10	-6.78	+16.9	01	09	24.9
10 WE	-06	27	39	-1368	-114.86	-6.76	+16.4	01	13	21.5
11 TH	-06	50	23	-1364	-121.60	-6.74	+16.0	01	17	18.1
12 FR	-07	13	01	-1358	-128.30	-6.70	+15.5	01	21	14.6
13 SA	-07	35	33	-1352	-134.98	-6.68	+15.0	01	25	11.2
14 SU	-07	57	59	-1346	-141.62	-6.64	+14.4	01	29	07.7
15 MO	-08	20	18	-1339	-148.24	-6.62	+13.9	01	33	04.3
16 TU	-08	42	31	-1333	-154.82	-6.58	+13.4	01	37	00.8
17 WE	-09	04	36	-1325	-161.36	-6.54	+12.7	01	40	57.4
18 TH	-09	26	33	-1317	-167.87	-6.51	+12.2	01	44	53.9
19 FR	-09	48	22	-1309	-174.33	-6.46	+11.6	01	48	50.5
20 SA	-10	10	03	-1301	-180.76	-6.43	+10.9	01	52	47.0
21 SU	-10	31	35	-1292	-187.14	-6.38	+10.3	01	56	43.6
22 MO	-10	52	57	-1282	-193.47	-6.33	+9.7	02	00	40.1
23 TU	-11	14	09	-1272	-199.75	-6.28	+9.0	02	04	36.7
24 WE	-11	35	11	-1262	-205.98	-6.23	+8.3	02	08	33.2
25 TH	-11	56	03	-1252	-212.16	-6.18	+7.7	02	12	29.8
26 FR	-12	16	44	-1241	-218.29	-6.13	+6.9	02	16	26.4
27 SA	-12	37	13	-1229	-224.36	-6.07	+6.3	02	20	22.9
28 SU	-12	57	30	-1217	-230.37	-6.01	+5.5	02	24	19.5
29 MO	-13	17	35	-1205	-236.32	-5.95	+4.8	02	28	16.0
30 TU	-13	37	28	-1193	-242.21	-5.89	+4.1	02	32	12.6
31 WE	-13	57	07	-1179	-248.03	-5.82	+3.3	02	36	09.1
				-1179		-5.82	+3.3			

Table 2c. Sun, 1990, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS		MIN	SEC	DAILY CHANGE [SEC]	HR	MIN	SEC
	°	' "	DAILY CHANGE [SEC]	DAILY CHANGE [MILS]						
NOV 1 TH	-14	16 34		-253.80	16	22.0		02	40	05.7
2 FR	-14	35 46	-1152	-259.49	16	23.7	+1.7	02	44	02.2
3 SA	-14	54 44	-1138	-265.11	16	24.7	+1.0	02	47	58.8
4 SU	-15	13 28	-1124	-270.66	16	24.8	+1.1	02	51	55.3
5 MO	-15	31 57	-1109	-276.13	16	24.1	-0.7	02	55	51.9
6 TU	-15	50 11	-1094	-281.54	16	22.6	-1.5	02	59	48.5
7 WE	-16	08 09	-1078	-286.86	16	20.2	-2.4	03	03	45.0
8 TH	-16	25 51	-1062	-292.10	16	17.0	-3.2	03	07	41.6
9 FR	-16	43 17	-1046	-297.27	16	12.9	-4.1	03	11	38.2
10 SA	-17	00 25	-1028	-302.35	16	08.0	-4.9	03	15	34.7
11 SU	-17	17 17	-1012	-307.34	16	02.2	-5.8	03	19	31.3
12 MO	-17	33 50	-993	-312.25	15	55.5	-6.7	03	23	27.8
13 TU	-17	50 06	-976	-317.07	15	48.0	-7.5	03	27	24.4
14 WE	-18	06 03	-957	-321.79	15	39.5	-8.5	03	31	20.9
15 TH	-18	21 41	-938	-326.42	15	30.3	-9.2	03	35	17.5
16 FR	-18	36 59	-918	-330.96	15	20.1	-10.2	03	39	14.0
17 SA	-18	51 58	-899	-335.40	15	09.2	-10.9	03	43	10.6
18 SU	-19	06 37	-879	-339.74	14	57.3	-11.9	03	47	07.1
19 MO	-19	20 55	-858	-343.98	14	44.7	-12.6	03	51	03.7
20 TU	-19	34 52	-837	-348.11	14	31.2	-13.5	03	55	00.3
21 WE	-19	48 28	-816	-352.14	14	16.9	-14.3	03	58	56.8
22 TH	-20	01 43	-795	-356.06	14	01.9	-15.0	04	02	53.4
23 FR	-20	14 35	-772	-359.88	13	46.0	-15.9	04	06	49.9
24 SA	-20	27 05	-750	-363.58	13	29.4	-16.6	04	10	46.5
25 SU	-20	39 12	-727	-367.17	13	12.0	-17.4	04	14	43.1
26 MO	-20	50 56	-704	-370.65	12	53.9	-18.1	04	18	39.6
27 TU	-21	02 17	-681	-374.01	12	35.0	-18.9	04	22	36.2
28 WE	-21	13 14	-657	-377.25	12	15.4	-19.6	04	26	32.7
29 TH	-21	23 47	-633	-380.38	11	55.2	-20.2	04	30	29.3
30 FR	-21	33 56	-609	-383.39	11	34.2	-21.0	04	34	25.8
			-609	-3.01			-21.0			

Table 2c. Sun, 1990, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS				DAILY CHANGE (SEC)			
	°	'	''	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)		MIN	SEC	HR MIN SEC
DEC 1 SA	-21	43	40		-386.27			11	12.6	04 38 22.4
2 SU	-21	52	59	-559	-389.03	-2.76	-22.2	10	50.4	04 42 18.9
3 MO	-22	01	53	-534	-391.67	-2.64	-22.9	10	27.5	04 46 15.5
4 TU	-22	10	22	-509	-394.18	-2.51	-23.5	10	04.0	04 50 12.1
5 WE	-22	18	25	-483	-396.57	-2.39	-24.1	09	39.9	04 54 08.6
6 TH	-22	26	03	-458	-398.83	-2.26	-24.7	09	15.2	04 58 05.2
7 FR	-22	33	14	-431	-400.96	-2.13	-25.2	08	50.0	05 02 01.8
8 SA	-22	39	58	-404	-402.95	-1.99	-25.8	08	24.2	05 05 58.3
9 SU	-22	46	16	-378	-404.82	-1.87	-26.2	07	58.0	05 09 54.9
10 MO	-22	52	08	-352	-406.56	-1.74	-26.8	07	31.2	05 13 51.4
11 TU	-22	57	32	-324	-408.16	-1.60	-27.2	07	04.0	05 17 48.0
12 WE	-23	02	29	-297	-409.62	-1.46	-27.6	06	36.4	05 21 44.5
13 TH	-23	06	58	-269	-410.95	-1.33	-28.0	06	08.4	05 25 41.1
14 FR	-23	11	00	-242	-412.15	-1.20	-28.4	05	40.0	05 29 37.6
15 SA	-23	14	34	-214	-413.20	-1.05	-28.7	05	11.3	05 33 34.2
16 SU	-23	17	40	-186	-414.12	-.92	-28.9	04	42.4	05 37 30.8
17 MO	-23	20	19	-159	-414.91	-.79	-29.2	04	13.2	05 41 27.3
18 TU	-23	22	29	-130	-415.55	-.64	-29.4	03	43.8	05 45 23.9
19 WE	-23	24	12	-103	-416.06	-.51	-29.6	03	14.2	05 49 20.5
20 TH	-23	25	26	-74	-416.42	-.36	-29.8	02	44.4	05 53 17.0
21 FR	-23	26	12	-46	-416.65	-.23	-29.8	02	14.6	05 57 13.6
22 SA	-23	26	29	-17	-416.74	-.09	-29.9	01	44.7	06 01 10.1
23 SU	-23	26	19	+10	-416.69	+.05	-29.9	01	14.8	06 05 06.7
24 MO	-23	25	40	+39	-416.49	+.20	-29.9	00	44.9	06 09 03.2
25 TU	-23	24	33	+67	-416.16	+.33	-29.8	00	15.1	06 12 59.8
26 WE	-23	22	58	+95	-415.69	+.47	-29.8	-00	14.7	06 16 56.3
27 TH	-23	20	54	+124	-415.08	+.61	-29.6	-00	44.3	06 20 52.9
28 FR	-23	18	23	+151	-414.34	+.74	-29.5	-01	13.8	06 24 49.5
29 SA	-23	15	23	+180	-413.45	+.89	-29.3	-01	43.1	06 28 46.0
30 SU	-23	11	56	+207	-412.42	+1.03	-29.1	-02	12.2	06 32 42.6
31 MO	-23	08	01	+235	-411.26	+1.16	-28.8	-02	41.0	06 36 39.2
32 TU	-23	03	38	+263	-409.97	+1.29	-28.6	-03	09.6	06 40 35.7

Table 2d. Sun, 1991, for Zero Hours Universal Time (GMT)

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS		MIN	SEC	DAILY CHANGE (SEC)	HR	MIN	SEC
	°	' "	DAILY CHANGE (SEC)	DAILY CHANGE (MILS)						
JAN 0 MO	-23	08 01		-411.26	-02	41.0		06	36	39.2
JAN 1 TU	-23	03 38	+263	-409.97	-03	09.6	-28.6	06	40	35.7
2 WE	-22	58 47	+291	-408.53	-03	37.9	-28.3	06	44	32.3
3 TH	-22	53 29	+318	-406.96	-04	05.8	-27.9	06	48	28.9
4 FR	-22	47 44	+345	-405.25	-04	33.5	-27.7	06	52	25.4
5 SA	-22	41 32	+372	-403.42	-05	00.7	-27.2	06	56	22.0
6 SU	-22	34 52	+400	-401.44	-05	27.6	-26.9	07	00	18.5
7 MO	-22	27 46	+426	-399.34	-05	54.0	-26.4	07	04	15.1
8 TU	-22	20 13	+453	-397.10	-06	20.0	-26.0	07	08	11.6
9 WE	-22	12 13	+480	-394.73	-06	45.5	-25.5	07	12	08.2
10 TH	-22	03 47	+506	-392.23	-07	10.5	-25.0	07	16	04.7
11 FR	-21	54 56	+531	-389.61	-07	34.9	-24.4	07	20	01.3
12 SA	-21	45 38	+558	-386.85	-07	58.8	-23.9	07	23	57.8
13 SU	-21	35 56	+582	-383.98	-08	22.1	-23.3	07	27	54.4
14 MO	-21	25 48	+608	-380.98	-08	44.8	-22.7	07	31	51.0
15 TU	-21	15 15	+633	-377.85	-09	06.9	-22.1	07	35	47.5
16 WE	-21	04 18	+657	-374.61	-09	28.4	-21.5	07	39	44.1
17 TH	-20	52 57	+681	-371.24	-09	49.1	-20.7	07	43	40.7
18 FR	-20	41 11	+706	-367.76	-10	09.1	-20.0	07	47	37.2
19 SA	-20	29 02	+729	-364.16	-10	28.5	-19.4	07	51	33.8
20 SU	-20	16 30	+752	-360.44	-10	47.1	-18.6	07	55	30.3
21 MO	-20	03 36	+774	-356.62	-11	04.9	-17.8	07	59	26.9
22 TU	-19	50 18	+798	-352.68	-11	22.0	-17.1	08	03	23.4
23 WE	-19	36 39	+819	-348.64	-11	38.3	-16.3	08	07	20.0
24 TH	-19	22 38	+841	-344.48	-11	53.8	-15.5	08	11	16.5
25 FR	-19	08 15	+863	-340.22	-12	08.5	-14.7	08	15	13.1
26 SA	-18	53 32	+883	-335.86	-12	22.4	-13.9	08	19	09.6
27 SU	-18	38 28	+904	-331.40	-12	35.4	-13.0	08	23	06.2
28 MO	-18	23 03	+925	-326.83	-12	47.7	-12.3	08	27	02.8
29 TU	-18	07 19	+944	-322.17	-12	59.1	-11.4	08	30	59.3
30 WE	-17	51 16	+963	-317.41	-13	09.7	-10.6	08	34	55.9
31 TH	-17	34 53	+983	-312.56	-13	19.5	-9.8	08	38	52.5
			+983	+4.85			-9.8			

Table 2d. Sun, 1991, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME		SIDEREAL TIME		
	DEGREES		MILS						
	°	' "	DAILY CHANGE (SEC)	DAILY CHANGE (MILS)	MIN	SEC	DAILY CHANGE (SEC)	HR	MIN SEC
FEB 1 FR	-17	18 11		-307.61	-13	28.5		08	42 49.0
2 SA	-17	01 12	+1019	-302.58	+5.03	-13 36.7	-8.2	08	46 45.6
3 SU	-16	43 54	+1038	-297.45	+5.13	-13 44.0	-7.3	08	50 42.1
4 MO	-16	26 18	+1056	-292.24	+5.21	-13 50.6	-6.6	08	54 38.7
5 TU	-16	08 26	+1072	-286.94	+5.30	-13 56.4	-5.8	08	58 35.2
6 WE	-15	50 16	+1090	-281.56	+5.38	-14 01.3	-4.9	09	02 31.8
7 TH	-15	31 50	+1106	-276.10	+5.46	-14 05.5	-4.2	09	06 28.3
8 FR	-15	13 08	+1122	-270.56	+5.54	-14 08.9	-3.4	09	10 24.9
9 SA	-14	54 11	+1137	-264.94	+5.62	-14 11.5	-2.6	09	14 21.4
10 SU	-14	34 58	+1153	-259.25	+5.69	-14 13.4	-1.9	09	18 18.0
11 MO	-14	15 30	+1168	-253.48	+5.77	-14 14.5	-1.1	09	22 14.6
12 TU	-13	55 49	+1181	-247.65	+5.83	-14 14.8	-.3	09	26 11.1
13 WE	-13	35 53	+1196	-241.74	+5.91	-14 14.4	+ .4	09	30 07.7
14 TH	-13	15 44	+1209	-235.77	+5.97	-14 13.2	+1.2	09	34 04.2
15 FR	-12	55 22	+1222	-229.74	+6.03	-14 11.2	+2.0	09	38 00.8
16 SA	-12	34 48	+1234	-223.64	+6.10	-14 08.6	+2.6	09	41 57.3
17 SU	-12	14 02	+1246	-217.49	+6.15	-14 05.2	+3.4	09	45 53.9
18 MO	-11	53 03	+1259	-211.27	+6.22	-14 01.1	+4.1	09	49 50.4
19 TU	-11	31 54	+1269	-205.01	+6.26	-13 56.3	+4.8	09	53 47.0
20 WE	-11	10 34	+1280	-198.69	+6.32	-13 50.8	+5.5	09	57 43.5
21 TH	-10	49 03	+1291	-192.31	+6.38	-13 44.6	+6.2	10	01 40.1
22 FR	-10	27 22	+1301	-185.89	+6.42	-13 37.7	+6.9	10	05 36.6
23 SA	-10	05 32	+1310	-179.42	+6.47	-13 30.2	+7.5	10	09 33.2
24 SU	-09	43 33	+1319	-172.90	+6.52	-13 22.0	+8.2	10	13 29.8
25 MO	-09	21 25	+1328	-166.35	+6.55	-13 13.3	+8.7	10	17 26.3
26 TU	-08	59 09	+1336	-159.75	+6.60	-13 03.9	+9.4	10	21 22.9
27 WE	-08	36 45	+1344	-153.11	+6.64	-12 53.9	+10.0	10	25 19.5
28 TH	-08	14 13	+1352	-146.43	+6.68	-12 43.4	+10.5	10	29 16.0
			+1352		+6.68		+10.5		

Table 2d. Sun, 1991, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS				DAILY CHANGE (SEC)			
	°	' "	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN	SEC	HR	MIN	SEC
MAR 1 FR	-07	51 34		-139.72		-12	32.3	10	33	12.6
2 SA	-07	28 48	+1366	-132.98	+6.74	-12	20.7	10	37	09.1
3 SU	-07	05 56	+1372	-126.20	+6.78	-12	08.6	10	41	05.6
4 MO	-06	42 57	+1379	-119.39	+6.81	-11	56.0	10	45	02.2
5 TU	-06	19 53	+1384	-112.56	+6.83	-11	43.0	10	48	58.7
6 WE	-05	56 44	+1389	-105.70	+6.86	-11	29.5	10	52	55.3
7 TH	-05	33 29	+1395	-98.81	+6.89	-11	15.6	10	56	51.9
8 FR	-05	10 10	+1399	-91.90	+6.91	-11	01.4	11	00	48.4
9 SA	-04	46 46	+1404	-84.97	+6.93	-10	46.7	11	04	45.0
10 SU	-04	23 19	+1407	-78.02	+6.95	-10	31.7	11	08	41.5
11 MO	-03	59 48	+1411	-71.05	+6.97	-10	16.4	11	12	38.1
12 TU	-03	36 15	+1413	-64.07	+6.98	-10	00.8	11	16	34.6
13 WE	-03	12 38	+1417	-57.08	+6.99	-09	44.8	11	20	31.2
14 TH	-02	49 00	+1418	-50.07	+7.01	-09	28.6	11	24	27.7
15 FR	-02	25 19	+1421	-43.06	+7.01	-09	12.1	11	28	24.3
16 SA	-02	01 37	+1422	-36.03	+7.03	-08	55.4	11	32	20.8
17 SU	-01	37 54	+1423	-29.01	+7.02	-08	38.5	11	36	17.4
18 MO	-01	14 11	+1423	-21.98	+7.03	-08	21.3	11	40	13.9
19 TU	-00	50 27	+1424	-14.95	+7.03	-08	04.0	11	44	10.5
20 WE	-00	26 43	+1424	-7.92	+7.03	-07	46.4	11	48	07.0
21 TH	-00	02 59	+1424	- .88	+7.04	-07	28.8	11	52	03.6
22 FR	00	20 43	+1422	+6.14	+7.02	-07	10.9	11	56	00.2
23 SA	00	44 24	+1421	+13.16	+7.02	-06	53.0	11	59	56.7
24 SU	01	08 04	+1420	+20.17	+7.01	-06	34.9	12	03	53.3
25 MO	01	31 42	+1418	+27.17	+7.00	-06	16.8	12	07	49.8
26 TU	01	55 17	+1415	+34.16	+6.99	-05	58.6	12	11	46.4
27 WE	02	18 50	+1413	+41.14	+6.98	-05	40.3	12	15	42.9
28 TH	02	42 19	+1409	+48.09	+6.95	-05	22.1	12	19	39.5
29 FR	03	05 46	+1407	+55.04	+6.95	-05	03.8	12	23	36.0
30 SA	03	29 08	+1402	+61.97	+6.93	-04	45.6	12	27	32.6
31 SU	03	52 27	+1399	+68.87	+6.90	-04	27.4	12	31	29.1
			+1399		+6.90					

Table 2d. Sun, 1991, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS				DAILY CHANGE (SEC)			
	°	'	''	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)		MIN	SEC	HR MIN SEC
APR 1 MO	04	15	42		+75.76			-04	09.4	12 35 25.7
2 TU	04	38	52	+1390	+82.63	+6.87	+18.0	-03	51.4	12 39 22.2
3 WE	05	01	57	+1385	+89.47	+6.84	+17.9	-03	33.5	12 43 18.8
4 TH	05	24	57	+1380	+96.28	+6.81	+17.7	-03	15.8	12 47 15.3
5 FR	05	47	51	+1374	+103.07	+6.79	+17.6	-02	58.2	12 51 11.9
6 SA	06	10	39	+1368	+109.82	+6.75	+17.4	-02	40.8	12 55 08.5
7 SU	06	33	21	+1362	+116.55	+6.73	+17.1	-02	23.7	12 59 05.0
8 MO	06	55	56	+1355	+123.24	+6.69	+17.0	-02	06.7	13 03 01.6
9 TU	07	18	25	+1349	+129.90	+6.66	+16.7	-01	50.0	13 06 58.1
10 WE	07	40	46	+1341	+136.52	+6.62	+16.5	-01	33.5	13 10 54.7
11 TH	08	02	59	+1333	+143.11	+6.59	+16.1	-01	17.4	13 14 51.2
12 FR	08	25	04	+1325	+149.65	+6.54	+15.9	-01	01.5	13 18 47.8
13 SA	08	47	01	+1317	+156.15	+6.50	+15.6	-00	45.9	13 22 44.3
14 SU	09	08	49	+1308	+162.61	+6.46	+15.3	-00	30.6	13 26 40.9
15 MO	09	30	28	+1299	+169.03	+6.42	+14.9	-00	15.7	13 30 37.4
16 TU	09	51	57	+1289	+175.39	+6.36	+14.6	-00	01.1	13 34 34.0
17 WE	10	13	17	+1280	+181.71	+6.32	+14.2	00	13.1	13 38 30.5
18 TH	10	34	26	+1269	+187.98	+6.27	+13.9	00	27.0	13 42 27.1
19 FR	10	55	25	+1259	+194.20	+6.22	+13.5	00	40.5	13 46 23.7
20 SA	11	16	13	+1248	+200.36	+6.16	+13.1	00	53.6	13 50 20.2
21 SU	11	36	50	+1237	+206.47	+6.11	+12.7	01	06.3	13 54 16.8
22 MO	11	57	15	+1225	+212.52	+6.05	+12.4	01	18.7	13 58 13.3
23 TU	12	17	28	+1213	+218.51	+5.99	+11.9	01	30.6	14 02 09.9
24 WE	12	37	29	+1201	+224.44	+5.93	+11.4	01	42.0	14 06 06.4
25 TH	12	57	17	+1188	+230.31	+5.87	+11.0	01	53.0	14 10 03.0
26 FR	13	16	53	+1176	+236.11	+5.80	+10.6	02	03.6	14 13 59.5
27 SA	13	36	15	+1162	+241.85	+5.74	+10.1	02	13.7	14 17 56.1
28 SU	13	55	24	+1149	+247.53	+5.68	+9.6	02	23.3	14 21 52.6
29 MO	14	14	19	+1135	+253.13	+5.60	+9.0	02	32.3	14 25 49.2
30 TU	14	33	01	+1122	+258.67	+5.54	+8.6	02	40.9	14 29 45.7
				+1122		+5.54	+8.6			

Table 2d. Sun, 1991, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS		MIN	SEC	DAILY CHANGE (SEC)	HR	MIN	SEC
	°	' "	DAILY CHANGE (SEC)	DAILY CHANGE (MILS)						
MAY 1 WE	14	51 28		+264.14	02	49.0		14	33	42.3
2 TH	15	09 40	+1092	+269.53	02	56.5	+7.5	14	37	38.9
3 FR	15	27 37	+1077	+274.85	03	03.4	+6.9	14	41	35.4
4 SA	15	45 19	+1062	+280.09	03	09.8	+6.4	14	45	32.0
5 SU	16	02 46	+1047	+285.26	03	15.7	+5.9	14	49	28.5
6 MO	16	19 56	+1030	+290.35	03	20.9	+5.2	14	53	25.1
7 TU	16	36 51	+1015	+295.36	03	25.6	+4.7	14	57	21.7
8 WE	16	53 28	+997	+300.29	03	29.7	+4.1	15	01	18.2
9 TH	17	09 49	+981	+305.13	03	33.3	+3.6	15	05	14.8
10 FR	17	25 53	+964	+309.89	03	36.2	+2.9	15	09	11.3
11 SA	17	41 40	+947	+314.57	03	38.5	+2.3	15	13	07.9
12 SU	17	57 08	+928	+319.15	03	40.3	+1.8	15	17	04.4
13 MO	18	12 19	+911	+323.65	03	41.4	+1.1	15	21	01.0
14 TU	18	27 11	+892	+328.05	03	42.0	+0.6	15	24	57.5
15 WE	18	41 44	+873	+332.37	03	42.0	+0.0	15	28	54.1
16 TH	18	55 59	+855	+336.59	03	41.5	-.5	15	32	50.6
17 FR	19	09 54	+835	+340.71	03	40.4	-1.1	15	36	47.2
18 SA	19	23 29	+815	+344.74	03	38.7	-1.7	15	40	43.8
19 SU	19	36 45	+796	+348.67	03	36.5	-2.2	15	44	40.3
20 MO	19	49 41	+776	+352.50	03	33.8	-2.7	15	48	36.9
21 TU	20	02 16	+755	+356.23	03	30.5	-3.3	15	52	33.4
22 WE	20	14 31	+735	+359.86	03	26.8	-3.7	15	56	30.0
23 TH	20	26 25	+714	+363.38	03	22.5	-4.3	16	00	26.6
24 FR	20	37 58	+693	+366.80	03	17.7	-4.8	16	04	23.1
25 SA	20	49 10	+672	+370.12	03	12.4	-5.3	16	08	19.7
26 SU	21	00 00	+650	+373.33	03	06.6	-5.8	16	12	16.2
27 MO	21	10 29	+629	+376.44	03	00.4	-6.2	16	16	12.8
28 TU	21	20 35	+606	+379.43	02	53.6	-6.8	16	20	09.3
29 WE	21	30 20	+585	+382.32	02	46.4	-7.2	16	24	05.9
30 TH	21	39 42	+562	+385.10	02	38.8	-7.6	16	28	02.4
31 FR	21	48 42	+540	+387.76	02	30.7	-8.1	16	31	59.0
			+540	+2.66			-8.1			

Table 2d. Sun, 1991, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE		APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
		DEGREES		MILS				DAILY CHANGE (SEC)			
		° ' "	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)						
						MIN	SEC		HR	MIN	SEC
JUN	1 SA	21 57 19		+390.32		02	22.2		16	35	55.6
	2 SU	22 05 33	+494	+392.76	+2.44	02	13.2	-9.0	16	39	52.1
	3 MO	22 13 24	+471	+395.08	+2.32	02	03.9	-9.3	16	43	48.7
	4 TU	22 20 52	+448	+397.29	+2.21	01	54.1	-9.8	16	47	45.2
	5 WE	22 27 56	+424	+399.39	+2.10	01	44.0	-10.1	16	51	41.8
	6 TH	22 34 37	+401	+401.37	+1.98	01	33.5	-10.5	16	55	38.3
	7 FR	22 40 54	+377	+403.23	+1.86	01	22.7	-10.8	16	59	34.9
	8 SA	22 46 47	+353	+404.97	+1.74	01	11.5	-11.2	17	03	31.5
	9 SU	22 52 16	+329	+406.60	+1.63	01	00.0	-11.5	17	07	28.0
	10 MO	22 57 21	+305	+408.10	+1.50	00	48.3	-11.7	17	11	24.6
	11 TU	23 02 02	+281	+409.49	+1.39	00	36.3	-12.0	17	15	21.1
	12 WE	23 06 18	+256	+410.76	+1.27	00	24.1	-12.2	17	19	17.7
	13 TH	23 10 10	+232	+411.90	+1.14	00	11.7	-12.4	17	23	14.3
	14 FR	23 13 37	+207	+412.92	+1.02	-00	00.9	-12.6	17	27	10.8
	15 SA	23 16 40	+183	+413.83	+0.91	-00	13.7	-12.8	17	31	07.4
	16 SU	23 19 18	+158	+414.61	+0.78	-00	26.5	-12.8	17	35	04.0
	17 MO	23 21 32	+134	+415.27	+0.66	-00	39.5	-13.0	17	39	00.5
	18 TU	23 23 21	+109	+415.81	+0.54	-00	52.5	-13.0	17	42	57.1
	19 WE	23 24 45	+84	+416.22	+0.41	-01	05.5	-13.0	17	46	53.6
	20 TH	23 25 44	+59	+416.51	+0.29	-01	18.6	-13.1	17	50	50.2
	21 FR	23 26 18	+34	+416.68	+0.17	-01	31.6	-13.0	17	54	46.7
	22 SA	23 26 28	+10	+416.73	+0.05	-01	44.7	-13.1	17	58	43.3
	23 SU	23 26 13	-15	+416.66	-0.07	-01	57.6	-12.9	18	02	39.8
	24 MO	23 25 33	-40	+416.46	-0.20	-02	10.5	-12.9	18	06	36.4
	25 TU	23 24 28	-65	+416.14	-0.32	-02	23.4	-12.9	18	10	33.0
	26 WE	23 22 59	-89	+415.70	-0.44	-02	36.1	-12.7	18	14	29.5
	27 TH	23 21 05	-114	+415.14	-0.56	-02	48.6	-12.5	18	18	26.1
	28 FR	23 18 46	-139	+414.45	-0.69	-03	01.1	-12.5	18	22	22.6
	29 SA	23 16 03	-163	+413.64	-0.81	-03	13.3	-12.2	18	26	19.2
	30 SU	23 12 56	-187	+412.72	-0.92	-03	25.4	-12.1	18	30	15.8
			-187		-0.92			-12.1			

Table 2d. Sun, 1991, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS				DAILY CHANGE (SEC)			
	°	'	''	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)		MIN	SEC	HR MIN SEC
JUL 1 MO	23	09	24		+411.67			-03	37.2	18 34 12.3
2 TU	23	05	27	-237	+410.50	-1.17	-11.6	-03	48.8	18 38 08.9
3 WE	23	01	07	-260	+409.22	-1.28	-11.4	-04	00.2	18 42 05.4
4 TH	22	56	22	-285	+407.81	-1.41	-11.1	-04	11.3	18 46 02.0
5 FR	22	51	13	-309	+406.29	-1.52	-10.8	-04	22.1	18 49 58.5
6 SA	22	45	41	-332	+404.65	-1.64	-10.6	-04	32.7	18 53 55.1
7 SU	22	39	44	-357	+402.88	-1.77	-10.2	-04	42.9	18 57 51.6
8 MO	22	33	24	-380	+401.01	-1.87	-9.8	-04	52.7	19 01 48.2
9 TU	22	26	40	-404	+399.01	-2.00	-9.5	-05	02.2	19 05 44.8
10 WE	22	19	33	-427	+396.90	-2.11	-9.1	-05	11.3	19 09 41.3
11 TH	22	12	03	-450	+394.68	-2.22	-8.7	-05	20.0	19 13 37.9
12 FR	22	04	10	-473	+392.35	-2.33	-8.3	-05	28.3	19 17 34.5
13 SA	21	55	54	-496	+389.90	-2.45	-7.8	-05	36.1	19 21 31.0
14 SU	21	47	16	-518	+387.34	-2.56	-7.3	-05	43.4	19 25 27.6
15 MO	21	38	16	-540	+384.67	-2.67	-6.9	-05	50.3	19 29 24.1
16 TU	21	28	53	-563	+381.89	-2.78	-6.3	-05	56.6	19 33 20.7
17 WE	21	19	08	-585	+379.00	-2.89	-5.8	-06	02.4	19 37 17.2
18 TH	21	09	02	-606	+376.01	-2.99	-5.3	-06	07.7	19 41 13.8
19 FR	20	58	34	-628	+372.91	-3.10	-4.7	-06	12.4	19 45 10.3
20 SA	20	47	45	-649	+369.70	-3.21	-4.2	-06	16.6	19 49 06.9
21 SU	20	36	36	-669	+366.40	-3.30	-3.6	-06	20.2	19 53 03.4
22 MO	20	25	05	-691	+362.99	-3.41	-3.0	-06	23.2	19 57 00.0
23 TU	20	13	14	-711	+359.48	-3.51	-2.4	-06	25.6	20 00 56.6
24 WE	20	01	03	-731	+355.87	-3.61	-1.9	-06	27.5	20 04 53.1
25 TH	19	48	32	-751	+352.16	-3.71	-1.2	-06	28.7	20 08 49.7
26 FR	19	35	41	-771	+348.35	-3.81	-.7	-06	29.4	20 12 46.3
27 SA	19	22	30	-791	+344.44	-3.91	-.1	-06	29.5	20 16 42.8
28 SU	19	09	01	-809	+340.45	-3.99	+5	-06	29.0	20 20 39.4
29 MO	18	55	12	-829	+336.36	-4.09	+1.2	-06	27.8	20 24 35.9
30 TU	18	41	05	-847	+332.17	-4.19	+1.7	-06	26.1	20 28 32.5
31 WE	18	26	39	-866	+327.90	-4.27	+2.3	-06	23.8	20 32 29.0
				-866		-4.27	+2.3			

Table 2d. Sun, 1991, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS				DAILY CHANGE [SEC]			
	°	'	''	DAILY CHANGE [SEC]	MILS	DAILY CHANGE [MILS]		MIN	SEC	HR MIN SEC
AUG 1 TH	18	11	55	-902	+323.53	-4.45	+3.5	-06	20.9	20 36 25.6
2 FR	17	56	53	-919	+319.08	-4.54	+4.1	-06	17.4	20 40 22.1
3 SA	17	41	34	-937	+314.54	-4.63	+4.7	-06	13.3	20 44 18.7
4 SU	17	25	57	-954	+309.91	-4.71	+5.2	-06	08.6	20 48 15.2
5 MO	17	10	03	-971	+305.20	-4.80	+5.9	-06	03.4	20 52 11.8
6 TU	16	53	52	-988	+300.40	-4.87	+6.4	-05	57.5	20 56 08.4
7 WE	16	37	24	-1003	+295.53	-4.96	+7.0	-05	51.1	21 00 04.9
8 TH	16	20	41	-1019	+290.57	-5.03	+7.6	-05	44.1	21 04 01.5
9 FR	16	03	42	-1035	+285.54	-5.11	+8.2	-05	36.5	21 07 58.0
10 SA	15	46	27	-1050	+280.43	-5.19	+8.7	-05	28.3	21 11 54.6
11 SU	15	28	57	-1065	+275.24	-5.25	+9.3	-05	19.6	21 15 51.2
12 MO	15	11	12	-1079	+269.99	-5.33	+9.9	-05	10.3	21 19 47.7
13 TU	14	53	13	-1094	+264.66	-5.41	+10.5	-05	00.4	21 23 44.3
14 WE	14	34	59	-1107	+259.25	-5.46	+11.0	-04	49.9	21 27 40.8
15 TH	14	16	32	-1121	+253.79	-5.54	+11.6	-04	38.9	21 31 37.4
16 FR	13	57	51	-1134	+248.25	-5.60	+12.1	-04	27.3	21 35 33.9
17 SA	13	38	57	-1147	+242.65	-5.66	+12.7	-04	15.2	21 39 30.5
18 SU	13	19	50	-1159	+236.99	-5.73	+13.1	-04	02.5	21 43 27.0
19 MO	13	00	31	-1172	+231.26	-5.78	+13.7	-03	49.4	21 47 23.6
20 TU	12	40	59	-1184	+225.48	-5.85	+14.2	-03	35.7	21 51 20.1
21 WE	12	21	15	-1195	+219.63	-5.90	+14.7	-03	21.5	21 55 16.7
22 TH	12	01	20	-1206	+213.73	-5.96	+15.2	-03	06.8	21 59 13.3
23 FR	11	41	14	-1218	+207.77	-6.01	+15.6	-02	51.6	22 03 09.8
24 SA	11	20	56	-1229	+201.76	-6.07	+16.0	-02	36.0	22 07 06.4
25 SU	11	00	27	-1238	+195.69	-6.11	+16.5	-02	20.0	22 11 02.9
26 MO	10	39	49	-1250	+189.58	-6.18	+16.8	-02	03.5	22 14 59.5
27 TU	10	18	59	-1258	+183.40	-6.21	+17.3	-01	46.7	22 18 56.0
28 WE	09	58	01	-1269	+177.19	-6.27	+17.6	-01	29.4	22 22 52.6
29 TH	09	36	52	-1278	+170.92	-6.31	+18.0	-01	11.8	22 26 49.1
30 FR	09	15	34	-1286	+164.61	-6.35	+18.3	-00	53.8	22 30 45.7
31 SA	08	54	08	-1286	+158.26	-6.35	+18.3	-00	35.5	22 34 42.2

Table 2d. Sun, 1991, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS		MIN	SEC	DAILY CHANGE (SEC)	HR	MIN	SEC
	°	' "	DAILY CHANGE (SEC)	DAILY CHANGE (MILS)						
SEP 1 SU	08	32 32		+151.86	-00	16.9		22	38	38.8
2 MO	08	10 48	-1304	+145.42	00	02.0	+18.9	22	42	35.3
3 TU	07	48 57	-1311	+138.95	00	21.1	+19.1	22	46	31.9
4 WE	07	26 57	-1320	+132.43	00	40.6	+19.5	22	50	28.4
5 TH	07	04 50	-1327	+125.88	01	00.2	+19.6	22	54	25.0
6 FR	06	42 36	-1334	+119.29	01	20.1	+19.9	22	58	21.6
7 SA	06	20 16	-1340	+112.67	01	40.2	+20.1	23	02	18.1
8 SU	05	57 49	-1347	+106.02	02	00.5	+20.3	23	06	14.7
9 MO	05	35 16	-1353	+99.34	02	21.0	+20.5	23	10	11.2
10 TU	05	12 38	-1358	+92.63	02	41.7	+20.7	23	14	07.8
11 WE	04	49 55	-1363	+85.90	03	02.5	+20.8	23	18	04.3
12 TH	04	27 06	-1369	+79.14	03	23.5	+21.0	23	22	00.9
13 FR	04	04 13	-1373	+72.36	03	44.5	+21.0	23	25	57.4
14 SA	03	41 16	-1377	+65.56	04	05.7	+21.2	23	29	54.0
15 SU	03	18 15	-1381	+58.74	04	27.0	+21.3	23	33	50.5
16 MO	02	55 11	-1384	+51.91	04	48.3	+21.3	23	37	47.1
17 TU	02	32 03	-1388	+45.05	05	09.7	+21.4	23	41	43.6
18 WE	02	08 53	-1390	+38.19	05	31.1	+21.4	23	45	40.2
19 TH	01	45 39	-1394	+31.30	05	52.5	+21.4	23	49	36.8
20 FR	01	22 24	-1395	+24.41	06	13.9	+21.4	23	53	33.3
21 SA	00	59 07	-1397	+17.52	06	35.3	+21.4	23	57	29.9
22 SU	00	35 48	-1399	+10.61	06	56.6	+21.3	00	01	26.4
23 MO	00	12 28	-1400	+3.69	07	17.8	+21.2	00	05	23.0
24 TU	-00	10 53	-1401	-3.22	07	38.9	+21.1	00	09	19.5
25 WE	-00	34 15	-1402	-10.15	07	59.9	+21.0	00	13	16.0
26 TH	-00	57 37	-1402	-17.07	08	20.8	+20.9	00	17	12.6
27 FR	-01	20 59	-1402	-24.00	08	41.4	+20.6	00	21	09.1
28 SA	-01	44 21	-1402	-30.92	09	01.9	+20.5	00	25	05.7
29 SU	-02	07 42	-1401	-37.84	09	22.1	+20.2	00	29	02.3
30 MO	-02	31 02	-1400	-44.75	09	42.1	+20.0	00	32	58.8
			-1400	-6.91			+20.0			

Table 2d. Sun, 1991, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME			
	DEGREES		DAILY CHANGE (SEC)	MILS		MIN	SEC	DAILY CHANGE (SEC)	HR	MIN	SEC
	°	' "		MILS	DAILY CHANGE (MILS)						
OCT 1 TU	-02	54 21		-51.66		10	01.8		00	36	55.4
2 WE	-03	17 38	-1397	-58.56	-6.90	10	21.2	+19.4	00	40	51.9
3 TH	-03	40 53	-1395	-65.45	-6.89	10	40.4	+19.2	00	44	48.5
4 FR	-04	04 06	-1393	-72.33	-6.88	10	59.1	+18.7	00	48	45.0
5 SA	-04	27 16	-1390	-79.19	-6.86	11	17.6	+18.5	00	52	41.6
6 SU	-04	50 23	-1387	-86.04	-6.85	11	35.6	+18.0	00	56	38.1
7 MO	-05	13 26	-1383	-92.87	-6.83	11	53.3	+17.7	01	00	34.7
8 TU	-05	36 25	-1379	-99.68	-6.81	12	10.6	+17.3	01	04	31.2
9 WE	-05	59 20	-1375	-106.47	-6.79	12	27.4	+16.8	01	08	27.8
10 TH	-06	22 10	-1370	-113.23	-6.76	12	43.9	+16.5	01	12	24.3
11 FR	-06	44 55	-1365	-119.98	-6.75	12	59.8	+15.9	01	16	20.9
12 SA	-07	07 35	-1360	-126.69	-6.71	13	15.4	+15.6	01	20	17.5
13 SU	-07	30 08	-1353	-133.37	-6.68	13	30.4	+15.0	01	24	14.0
14 MO	-07	52 36	-1348	-140.03	-6.66	13	45.0	+14.6	01	28	10.6
15 TU	-08	14 56	-1340	-146.65	-6.62	13	59.0	+14.0	01	32	07.1
16 WE	-08	37 10	-1334	-153.23	-6.58	14	12.5	+13.5	01	36	03.7
17 TH	-08	59 16	-1326	-159.78	-6.55	14	25.5	+13.0	01	40	00.2
18 FR	-09	21 15	-1319	-166.30	-6.52	14	37.9	+12.4	01	43	56.8
19 SA	-09	43 05	-1310	-172.77	-6.47	14	49.7	+11.8	01	47	53.3
20 SU	-10	04 47	-1302	-179.20	-6.43	15	00.9	+11.2	01	51	49.9
21 MO	-10	26 20	-1293	-185.58	-6.38	15	11.5	+10.6	01	55	46.4
22 TU	-10	47 44	-1284	-191.92	-6.34	15	21.5	+10.0	01	59	43.0
23 WE	-11	08 58	-1274	-198.21	-6.29	15	30.8	+9.3	02	03	39.5
24 TH	-11	30 02	-1264	-204.45	-6.24	15	39.4	+8.6	02	07	36.1
25 FR	-11	50 55	-1253	-210.64	-6.19	15	47.3	+7.9	02	11	32.6
26 SA	-12	11 38	-1243	-216.78	-6.14	15	54.6	+7.3	02	15	29.2
27 SU	-12	32 10	-1232	-222.86	-6.08	16	01.1	+6.5	02	19	25.8
28 MO	-12	52 31	-1221	-228.89	-6.03	16	06.8	+5.7	02	23	22.3
29 TU	-13	12 39	-1208	-234.86	-5.97	16	11.8	+5.0	02	27	18.9
30 WE	-13	32 35	-1196	-240.77	-5.91	16	16.0	+4.2	02	31	15.4
31 TH	-13	52 19	-1184	-246.61	-5.84	16	19.4	+3.4	02	35	12.0
			-1184		-5.84			+3.4			

Table 2d. Sun, 1991, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS		MIN	SEC	DAILY CHANGE (SEC)	HR	MIN	SEC
	°	'	"	DAILY CHANGE (SEC)						
NOV 1 FR	-14	11	49	-1156	-252.39	-5.71	16 22.0	+1.8	02 39 08.6	
2 SA	-14	31	05	-1143	-258.10	-5.64	16 23.8	+1.0	02 43 05.1	
3 SU	-14	50	08	-1128	-263.74	-5.57	16 24.8	+1.1	02 47 01.7	
4 MO	-15	08	56	-1114	-269.31	-5.50	16 24.9	-0.7	02 50 58.2	
5 TU	-15	27	30	-1098	-274.81	-5.43	16 24.2	-1.5	02 54 54.8	
6 WE	-15	45	48	-1082	-280.24	-5.34	16 22.7	-2.3	02 58 51.3	
7 TH	-16	03	50	-1066	-285.58	-5.26	16 20.4	-3.2	03 02 47.9	
8 FR	-16	21	36	-1050	-290.84	-5.19	16 17.2	-4.0	03 06 44.4	
9 SA	-16	39	06	-1033	-296.03	-5.10	16 13.2	-4.8	03 10 41.0	
10 SU	-16	56	19	-1016	-301.13	-5.02	16 08.4	-5.7	03 14 37.5	
11 MO	-17	13	15	-997	-306.15	-4.92	16 02.7	-6.5	03 18 34.1	
12 TU	-17	29	52	-980	-311.07	-4.84	15 56.2	-7.4	03 22 30.7	
13 WE	-17	46	12	-961	-315.91	-4.75	15 48.8	-8.2	03 26 27.2	
14 TH	-18	02	13	-942	-320.66	-4.65	15 40.6	-9.0	03 30 23.8	
15 FR	-18	17	55	-923	-325.31	-4.56	15 31.6	-9.8	03 34 20.3	
16 SA	-18	33	18	-903	-329.87	-4.46	15 21.8	-10.7	03 38 16.9	
17 SU	-18	48	21	-884	-334.33	-4.36	15 11.1	-11.5	03 42 13.4	
18 MO	-19	03	05	-862	-338.69	-4.26	14 59.6	-12.3	03 46 10.0	
19 TU	-19	17	27	-842	-342.95	-4.16	14 47.3	-13.1	03 50 06.5	
20 WE	-19	31	29	-821	-347.11	-4.05	14 34.2	-13.9	03 54 03.1	
21 TH	-19	45	10	-799	-351.16	-3.95	14 20.3	-14.8	03 57 59.6	
22 FR	-19	58	29	-777	-355.11	-3.83	14 05.5	-15.5	04 01 56.2	
23 SA	-20	11	26	-756	-358.94	-3.74	13 50.0	-16.3	04 05 52.8	
24 SU	-20	24	02	-732	-362.68	-3.61	13 33.7	-17.1	04 09 49.3	
25 MO	-20	36	14	-710	-366.29	-3.51	13 16.6	-17.9	04 13 45.9	
26 TU	-20	48	04	-687	-369.80	-3.39	12 58.7	-18.7	04 17 42.5	
27 WE	-20	59	31	-663	-373.19	-3.27	12 40.0	-19.4	04 21 39.0	
28 TH	-21	10	34	-639	-376.46	-3.16	12 20.6	-20.1	04 25 35.6	
29 FR	-21	21	13	-615	-379.62	-3.04	12 00.5	-20.9	04 29 32.1	
30 SA	-21	31	28	-615	-382.66	-3.04	11 39.6	-20.9	04 33 28.7	

Table 2d. Sun, 1991, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS		MIN	SEC	DAILY CHANGE (SEC)	HR	MIN	SEC
	°	' "	DAILY CHANGE (SEC)	DAILY CHANGE (MILS)						
DEC 1 SU	-21	41 19		-385.58	11	18.0		04	37	25.2
2 MO	-21	50 44	-565	-388.37	10	55.7	-22.3	04	41	21.8
3 TU	-21	59 45	-541	-391.04	10	32.8	-22.9	04	45	18.3
4 WE	-22	08 20	-515	-393.58	10	09.3	-23.5	04	49	14.9
5 TH	-22	16 29	-489	-396.00	09	45.1	-24.2	04	53	11.5
6 FR	-22	24 13	-464	-398.29	09	20.4	-24.7	04	57	08.0
7 SA	-22	31 30	-437	-400.44	08	55.1	-25.3	05	01	04.6
8 SU	-22	38 21	-411	-402.47	08	29.3	-25.8	05	05	01.1
9 MO	-22	44 45	-384	-404.37	08	03.0	-26.3	05	08	57.7
10 TU	-22	50 43	-358	-406.14	07	36.3	-26.7	05	12	54.3
11 WE	-22	56 13	-330	-407.77	07	09.1	-27.2	05	16	50.8
12 TH	-23	01 16	-303	-409.26	06	41.6	-27.5	05	20	47.4
13 FR	-23	05 52	-276	-410.63	06	13.7	-27.9	05	24	43.9
14 SA	-23	10 01	-249	-411.86	05	45.5	-28.2	05	28	40.5
15 SU	-23	13 41	-220	-412.94	05	16.9	-28.6	05	32	37.0
16 MO	-23	16 54	-193	-413.90	04	48.1	-28.8	05	36	33.6
17 TU	-23	19 39	-165	-414.71	04	19.1	-29.0	05	40	30.1
18 WE	-23	21 57	-138	-415.39	03	49.9	-29.2	05	44	26.7
19 TH	-23	23 46	-109	-415.93	03	20.5	-29.4	05	48	23.3
20 FR	-23	25 07	-81	-416.33	02	51.0	-29.5	05	52	19.8
21 SA	-23	26 00	-53	-416.59	02	21.4	-29.6	05	56	16.4
22 SU	-23	26 24	-24	-416.71	01	51.7	-29.7	06	00	13.0
23 MO	-23	26 21	+3	-416.70	01	21.9	-29.8	06	04	09.5
24 TU	-23	25 49	+32	-416.54	00	52.1	-29.8	06	08	06.1
25 WE	-23	24 49	+60	-416.24	00	22.4	-29.7	06	12	02.7
26 TH	-23	23 21	+88	-415.81	-00	07.4	-29.8	06	15	59.2
27 FR	-23	21 24	+117	-415.23	-00	37.1	-29.7	06	19	55.8
28 SA	-23	19 00	+144	-414.52	-01	06.6	-29.5	06	23	52.3
29 SU	-23	16 07	+173	-413.66	-01	36.0	-29.4	06	27	48.9
30 MO	-23	12 46	+201	-412.67	-02	05.3	-29.3	06	31	45.4
31 TU	-23	08 57	+229	-411.54	-02	34.4	-29.1	06	35	42.0
32 WE	-23	04 41	+256	-410.28	-03	03.2	-28.8	06	39	38.5

Table 2e. Sun, 1992, for Zero Hours Universal Time (GMT)

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS		MIN	SEC	DAILY CHANGE (SEC)	HR	MIN	SEC
	°	' "	DAILY CHANGE (SEC)	DAILY CHANGE (MILS)						
JAN 0 TU	-23	08 57		-411.54	-02	34.4		06	35	42.0
JAN 1 WE	-23	04 41	+256	-410.28	-03	03.2	-28.8	06	39	38.5
2 TH	-22	59 56	+285	-408.87	-03	31.7	-28.5	06	43	35.1
3 FR	-22	54 44	+312	-407.33	-04	00.0	-28.3	06	47	31.7
4 SA	-22	49 05	+339	-405.65	-04	27.8	-27.8	06	51	28.2
5 SU	-22	42 58	+367	-403.84	-04	55.4	-27.6	06	55	24.8
6 MO	-22	36 25	+393	-401.90	-05	22.5	-27.1	06	59	21.3
7 TU	-22	29 24	+421	-399.82	-05	49.1	-26.6	07	03	17.9
8 WE	-22	21 57	+447	-397.61	-06	15.3	-26.2	07	07	14.5
9 TH	-22	14 04	+473	-395.28	-06	41.0	-25.7	07	11	11.0
10 FR	-22	05 44	+500	-392.81	-07	06.1	-25.1	07	15	07.6
11 SA	-21	56 59	+525	-390.22	-07	30.7	-24.6	07	19	04.1
12 SU	-21	47 48	+551	-387.50	-07	54.7	-24.0	07	23	00.7
13 MO	-21	38 11	+577	-384.65	-08	18.1	-23.4	07	26	57.2
14 TU	-21	28 10	+601	-381.68	-08	40.9	-22.8	07	30	53.8
15 WE	-21	17 43	+627	-378.58	-09	03.0	-22.1	07	34	50.3
16 TH	-21	06 52	+651	-375.37	-09	24.5	-21.5	07	38	46.9
17 FR	-20	55 37	+675	-372.03	-09	45.2	-20.7	07	42	43.5
18 SA	-20	43 58	+699	-368.58	-10	05.3	-20.1	07	46	40.0
19 SU	-20	31 56	+722	-365.02	-10	24.6	-19.3	07	50	36.6
20 MO	-20	19 30	+746	-361.33	-10	43.2	-18.6	07	54	33.2
21 TU	-20	06 41	+769	-357.54	-11	01.1	-17.9	07	58	29.7
22 WE	-19	53 30	+791	-353.63	-11	18.2	-17.1	08	02	26.3
23 TH	-19	39 57	+813	-349.61	-11	34.6	-16.4	08	06	22.8
24 FR	-19	26 01	+836	-345.49	-11	50.2	-15.6	08	10	19.4
25 SA	-19	11 44	+857	-341.25	-12	05.0	-14.8	08	14	15.9
26 SU	-18	57 05	+879	-336.91	-12	19.1	-14.1	08	18	12.5
27 MO	-18	42 06	+899	-332.47	-12	32.5	-13.4	08	22	09.0
28 TU	-18	26 46	+920	-327.93	-12	45.0	-12.5	08	26	05.6
29 WE	-18	11 06	+940	-323.29	-12	56.7	-11.7	08	30	02.2
30 TH	-17	55 06	+960	-318.55	-13	07.7	-11.0	08	33	58.7
31 FR	-17	38 47	+979	-313.71	-13	17.8	-10.1	08	37	55.3
			+979	+4.84			-10.1			

Table 2e. Sun, 1992, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE		APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
		DEGREES		MILS				DAILY CHANGE (SEC)			
		°	'	''					HR	MIN	SEC
FEB	1 SA	-17	22	09							
					-308.79		-13	27.1	08	41	51.8
	2 SU	-17	05	13	+1016	+5.02	-13	35.7	08	45	48.4
	3 MO	-16	47	58	+1035	+5.11	-13	43.4	08	49	45.0
	4 TU	-16	30	26	+1052	+5.20	-13	50.3	08	53	41.5
	5 WE	-16	12	37	+1069	+5.28	-13	56.4	08	57	38.1
	6 TH	-15	54	31	+1086	+5.36	-14	01.7	09	01	34.6
	7 FR	-15	36	08	+1103	+5.45	-14	06.1	09	05	31.2
	8 SA	-15	17	30	+1118	+5.52	-14	09.8	09	09	27.7
	9 SU	-14	58	36	+1134	+5.60	-14	12.6	09	13	24.3
	10 MO	-14	39	27	+1149	+5.67	-14	14.6	09	17	20.8
	11 TU	-14	20	04	+1163	+5.75	-14	15.8	09	21	17.4
	12 WE	-14	00	26	+1178	+5.81	-14	16.3	09	25	13.9
	13 TH	-13	40	34	+1192	+5.89	-14	15.9	09	29	10.5
	14 FR	-13	20	29	+1205	+5.95	-14	14.8	09	33	07.0
	15 SA	-13	00	11	+1218	+6.01	-14	12.9	09	37	03.6
	16 SU	-12	39	41	+1230	+6.08	-14	10.3	09	41	00.2
	17 MO	-12	18	58	+1243	+6.14	-14	06.9	09	44	56.7
	18 TU	-11	58	04	+1254	+6.19	-14	02.8	09	48	53.3
	19 WE	-11	36	58	+1266	+6.25	-13	58.0	09	52	49.8
	20 TH	-11	15	42	+1276	+6.30	-13	52.5	09	56	46.4
	21 FR	-10	54	14	+1288	+6.36	-13	46.4	10	00	42.9
	22 SA	-10	32	37	+1297	+6.41	-13	39.6	10	04	39.5
	23 SU	-10	10	49	+1308	+6.46	-13	32.2	10	08	36.0
	24 MO	-09	48	52	+1317	+6.50	-13	24.2	10	12	32.6
	25 TU	-09	26	46	+1326	+6.55	-13	15.6	10	16	29.1
	26 WE	-09	04	31	+1335	+6.59	-13	06.4	10	20	25.7
	27 TH	-08	42	08	+1343	+6.63	-12	56.6	10	24	22.3
	28 FR	-08	19	37	+1351	+6.68	-12	46.3	10	28	18.8
	29 SA	-07	56	59	+1358	+6.70	-12	35.5	10	32	15.4
					+1358	+6.70		+10.8			

Table 2e. Sun, 1992, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS		MIN	SEC	DAILY CHANGE (SEC)	HR	MIN	SEC
	°	' "	DAILY CHANGE (SEC)	DAILY CHANGE (MILS)						
MAR 1 SU	-07	34 13		-134.58	-12	24.2		10	36	11.9
2 MO	-07	11 22	+1371	-127.81	-12	12.3	+11.9	10	40	08.5
3 TU	-06	48 24	+1378	-121.01	-12	00.0	+12.3	10	44	05.0
4 WE	-06	25 20	+1384	-114.17	-11	47.2	+12.8	10	48	01.6
5 TH	-06	02 11	+1389	-107.31	-11	34.0	+13.2	10	51	58.1
6 FR	-05	38 57	+1394	-100.43	-11	20.3	+13.7	10	55	54.7
7 SA	-05	15 38	+1399	-93.52	-11	06.2	+14.1	10	59	51.2
8 SU	-04	52 15	+1403	-86.59	-10	51.8	+14.4	11	03	47.8
9 MO	-04	28 49	+1406	-79.65	-10	36.9	+14.9	11	07	44.3
10 TU	-04	05 19	+1410	-72.69	-10	21.7	+15.2	11	11	40.9
11 WE	-03	41 47	+1412	-65.71	-10	06.1	+15.6	11	15	37.4
12 TH	-03	18 11	+1416	-58.72	-09	50.2	+15.9	11	19	34.0
13 FR	-02	54 34	+1417	-51.72	-09	33.9	+16.3	11	23	30.5
14 SA	-02	30 55	+1419	-44.72	-09	17.4	+16.5	11	27	27.1
15 SU	-02	07 14	+1421	-37.70	-09	00.6	+16.8	11	31	23.7
16 MO	-01	43 33	+1421	-30.68	-08	43.6	+17.0	11	35	20.2
17 TU	-01	19 50	+1423	-23.65	-08	26.3	+17.3	11	39	16.8
18 WE	-00	56 08	+1422	-16.63	-08	08.9	+17.4	11	43	13.3
19 TH	-00	32 25	+1423	-9.60	-07	51.2	+17.7	11	47	09.9
20 FR	-00	08 42	+1423	-2.58	-07	33.4	+17.8	11	51	06.4
21 SA	00	15 00	+1422	+4.44	-07	15.5	+17.9	11	55	03.0
22 SU	00	38 41	+1421	+11.46	-06	57.5	+18.0	11	58	59.5
23 MO	01	02 20	+1419	+18.47	-06	39.4	+18.1	12	02	56.1
24 TU	01	25 58	+1418	+25.47	-06	21.2	+18.2	12	06	52.6
25 WE	01	49 35	+1417	+32.47	-06	03.0	+18.2	12	10	49.2
26 TH	02	13 08	+1413	+39.45	-05	44.8	+18.2	12	14	45.7
27 FR	02	36 39	+1411	+46.41	-05	26.6	+18.2	12	18	42.3
28 SA	03	00 07	+1408	+53.37	-05	08.5	+18.1	12	22	38.9
29 SU	03	23 32	+1405	+60.31	-04	50.3	+18.2	12	26	35.4
30 MO	03	46 52	+1400	+67.22	-04	32.3	+18.0	12	30	32.0
31 TU	04	10 09	+1397	+74.12	-04	14.3	+18.0	12	34	28.5
			+1397	+6.90			+18.0			

Table 2e. Sun, 1992, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS				DAILY CHANGE (SEC)			
	°	'	"	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)		MIN	SEC	
APR 1 WE	04	33	21		+80.99			-03	56.4	12 38 25.1
2 TH	04	56	28	+1387	+87.84	+6.85	+17.7	-03	38.7	12 42 21.6
3 FR	05	19	30	+1382	+94.67	+6.83	+17.6	-03	21.1	12 46 18.1
4 SA	05	42	26	+1376	+101.46	+6.79	+17.5	-03	03.6	12 50 14.7
5 SU	06	05	16	+1370	+108.23	+6.77	+17.3	-02	46.3	12 54 11.2
6 MO	06	28	00	+1364	+114.96	+6.73	+17.2	-02	29.1	12 58 07.8
7 TU	06	50	37	+1357	+121.66	+6.70	+16.9	-02	12.2	13 02 04.4
8 WE	07	13	06	+1349	+128.33	+6.67	+16.7	-01	55.5	13 06 00.9
9 TH	07	35	29	+1343	+134.96	+6.63	+16.6	-01	38.9	13 09 57.5
10 FR	07	57	44	+1335	+141.55	+6.59	+16.2	-01	22.7	13 13 54.0
11 SA	08	19	50	+1326	+148.10	+6.55	+16.1	-01	06.6	13 17 50.6
12 SU	08	41	48	+1318	+154.61	+6.51	+15.7	-00	50.9	13 21 47.1
13 MO	09	03	37	+1309	+161.07	+6.46	+15.5	-00	35.4	13 25 43.7
14 TU	09	25	17	+1300	+167.49	+6.42	+15.1	-00	20.3	13 29 40.2
15 WE	09	46	48	+1291	+173.87	+6.38	+14.9	-00	05.4	13 33 36.8
16 TH	10	08	09	+1281	+180.19	+6.32	+14.5	00	09.1	13 37 33.3
17 FR	10	29	20	+1271	+186.47	+6.28	+14.1	00	23.2	13 41 29.9
18 SA	10	50	20	+1260	+192.69	+6.22	+13.8	00	37.0	13 45 26.4
19 SU	11	11	10	+1250	+198.86	+6.17	+13.3	00	50.3	13 49 23.0
20 MO	11	31	49	+1239	+204.98	+6.12	+13.0	01	03.3	13 53 19.6
21 TU	11	52	17	+1228	+211.05	+6.07	+12.5	01	15.8	13 57 16.1
22 WE	12	12	33	+1216	+217.05	+6.00	+12.1	01	27.9	14 01 12.7
23 TH	12	32	37	+1204	+223.00	+5.95	+11.6	01	39.5	14 05 09.2
24 FR	12	52	28	+1191	+228.88	+5.88	+11.1	01	50.6	14 09 05.8
25 SA	13	12	07	+1179	+234.70	+5.82	+10.6	02	01.2	14 13 02.3
26 SU	13	31	34	+1167	+240.46	+5.76	+10.1	02	11.3	14 16 58.9
27 MO	13	50	46	+1152	+246.15	+5.69	+9.6	02	20.9	14 20 55.5
28 TU	14	09	46	+1140	+251.78	+5.63	+9.1	02	30.0	14 24 52.0
29 WE	14	28	31	+1125	+257.34	+5.56	+8.6	02	38.6	14 28 48.6
30 TH	14	47	02	+1111	+262.82	+5.48	+8.0	02	46.6	14 32 45.1
				+1111		+5.48	+8.0			

Table 2e. Sun, 1992, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS		MIN	SEC	DAILY CHANGE (SEC)	HR	MIN	SEC
	°	'	"	DAILY CHANGE (SEC)						
MAY 1 FR	15	05	18		02	54.1		14	36	41.6
2 SA	15	23	19	+1081	03	01.1	+7.0	14	40	38.2
3 SU	15	41	05	+1066	03	07.5	+6.4	14	44	34.8
4 MO	15	58	36	+1051	03	13.3	+5.8	14	48	31.3
5 TU	16	15	50	+1034	03	18.6	+5.3	14	52	27.9
6 WE	16	32	49	+1019	03	23.4	+4.8	14	56	24.4
7 TH	16	49	30	+1001	03	27.6	+4.2	15	00	21.0
8 FR	17	05	55	+985	03	31.2	+3.6	15	04	17.6
9 SA	17	22	03	+968	03	34.3	+3.1	15	08	14.1
10 SU	17	37	53	+950	03	36.9	+2.6	15	12	10.7
11 MO	17	53	25	+932	03	38.9	+2.0	15	16	07.2
12 TU	18	08	39	+914	03	40.3	+1.4	15	20	03.8
13 WE	18	23	35	+896	03	41.2	+0.9	15	24	00.3
14 TH	18	38	12	+877	03	41.6	+0.4	15	27	56.9
15 FR	18	52	31	+859	03	41.4	-0.2	15	31	53.4
16 SA	19	06	30	+839	03	40.6	-0.8	15	35	50.0
17 SU	19	20	10	+820	03	39.2	-1.4	15	39	46.5
18 MO	19	33	30	+800	03	37.3	-1.9	15	43	43.1
19 TU	19	46	31	+781	03	34.9	-2.4	15	47	39.7
20 WE	19	59	11	+760	03	31.9	-3.0	15	51	36.2
21 TH	20	11	31	+740	03	28.3	-3.6	15	55	32.8
22 FR	20	23	30	+719	03	24.2	-4.1	15	59	29.3
23 SA	20	35	08	+698	03	19.5	-4.7	16	03	25.9
24 SU	20	46	25	+677	03	14.4	-5.1	16	07	22.5
25 MO	20	57	21	+656	03	08.7	-5.7	16	11	19.0
26 TU	21	07	55	+634	03	02.4	-6.3	16	15	15.6
27 WE	21	18	07	+612	02	55.7	-6.7	16	19	12.1
28 TH	21	27	57	+590	02	48.5	-7.2	16	23	08.7
29 FR	21	37	25	+568	02	40.8	-7.7	16	27	05.2
30 SA	21	46	30	+545	02	32.7	-8.1	16	31	01.8
31 SU	21	55	13	+523	02	24.1	-8.6	16	34	58.3
				+523			-8.6			

Table 2e. Sun, 1992, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME			
	DEGREES		DAILY CHANGE (SEC)	MILS		MIN	SEC	DAILY CHANGE (SEC)	HR	MIN	SEC
	°	' "		MILS	DAILY CHANGE (MILS)						
JUN 1 MO	22	03 32		+392.16		02	15.1		16	38	54.9
2 TU	22	11 29	+477	+394.51	+2.35	02	05.7	-9.4	16	42	51.5
3 WE	22	19 02	+453	+396.75	+2.24	01	55.9	-9.8	16	46	48.0
4 TH	22	26 12	+430	+398.87	+2.12	01	45.8	-10.1	16	50	44.6
5 FR	22	32 58	+406	+400.88	+2.01	01	35.3	-10.5	16	54	41.2
6 SA	22	39 21	+383	+402.77	+1.89	01	24.6	-10.7	16	58	37.7
7 SU	22	45 20	+359	+404.54	+1.77	01	13.5	-11.1	17	02	34.3
8 MO	22	50 55	+335	+406.20	+1.66	01	02.2	-11.3	17	06	30.8
9 TU	22	56 05	+310	+407.73	+1.53	00	50.6	-11.6	17	10	27.4
10 WE	23	00 52	+287	+409.15	+1.42	00	38.8	-11.8	17	14	23.9
11 TH	23	05 14	+262	+410.44	+1.29	00	26.8	-12.0	17	18	20.5
12 FR	23	09 12	+238	+411.61	+1.17	00	14.7	-12.1	17	22	17.0
13 SA	23	12 45	+213	+412.67	+1.06	00	02.3	-12.4	17	26	13.6
14 SU	23	15 54	+189	+413.60	+0.93	-00	10.2	-12.5	17	30	10.2
15 MO	23	18 38	+164	+414.41	+0.81	-00	22.8	-12.6	17	34	06.7
16 TU	23	20 58	+140	+415.10	+0.69	-00	35.6	-12.8	17	38	03.3
17 WE	23	22 53	+115	+415.67	+0.57	-00	48.4	-12.8	17	41	59.8
18 TH	23	24 23	+90	+416.11	+0.44	-01	01.3	-12.9	17	45	56.4
19 FR	23	25 29	+66	+416.44	+0.33	-01	14.3	-13.0	17	49	53.0
20 SA	23	26 09	+40	+416.64	+0.20	-01	27.3	-13.0	17	53	49.5
21 SU	23	26 25	+16	+416.72	+0.08	-01	40.3	-13.0	17	57	46.1
22 MO	23	26 16	-9	+416.67	-0.05	-01	53.3	-13.0	18	01	42.6
23 TU	23	25 42	-34	+416.50	-0.17	-02	06.2	-12.9	18	05	39.2
24 WE	23	24 44	-58	+416.22	-0.28	-02	19.1	-12.9	18	09	35.7
25 TH	23	23 20	-84	+415.80	-0.42	-02	32.0	-12.9	18	13	32.3
26 FR	23	21 32	-108	+415.27	-0.53	-02	44.7	-12.7	18	17	28.8
27 SA	23	19 19	-133	+414.61	-0.66	-02	57.3	-12.6	18	21	25.4
28 SU	23	16 42	-157	+413.84	-0.77	-03	09.7	-12.4	18	25	22.0
29 MO	23	13 40	-182	+412.94	-0.90	-03	22.0	-12.3	18	29	18.5
30 TU	23	10 13	-207	+411.92	-1.02	-03	34.1	-12.1	18	33	15.1
			-207		-1.02			-12.1			

Table 2e. Sun, 1992, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION					EQUATION OF TIME			SIDEREAL TIME		
	DEGREES			MILS		MIN	SEC	DAILY CHANGE (SEC)	HR	MIN	SEC
	°	'	"	DAILY CHANGE (SEC)	DAILY CHANGE (MILS)						
JUL 1 WE	23	06	22		+410.78	-03	45.9		18	37	11.6
2 TH	23	02	07	-255	+409.52	-03	57.4	-11.5	18	41	08.2
3 FR	22	57	28	-279	+408.14	-04	08.7	-11.3	18	45	04.8
4 SA	22	52	25	-303	+406.64	-04	19.7	-11.0	18	49	01.3
5 SU	22	46	58	-327	+405.03	-04	30.3	-10.6	18	52	57.9
6 MO	22	41	07	-351	+403.29	-04	40.6	-10.3	18	56	54.4
7 TU	22	34	53	-374	+401.45	-04	50.5	-9.9	19	00	51.0
8 WE	22	28	16	-397	+399.49	-05	00.0	-9.5	19	04	47.5
9 TH	22	21	15	-421	+397.41	-05	09.0	-9.0	19	08	44.1
10 FR	22	13	51	-444	+395.21	-05	17.7	-8.7	19	12	40.6
11 SA	22	06	04	-467	+392.91	-05	25.9	-8.2	19	16	37.2
12 SU	21	57	54	-490	+390.49	-05	33.6	-7.7	19	20	33.8
13 MO	21	49	22	-512	+387.96	-05	40.9	-7.3	19	24	30.3
14 TU	21	40	27	-535	+385.32	-05	47.7	-6.8	19	28	26.9
15 WE	21	31	11	-556	+382.57	-05	54.0	-6.3	19	32	23.5
16 TH	21	21	32	-579	+379.71	-05	59.8	-5.8	19	36	20.0
17 FR	21	11	32	-600	+376.75	-06	05.0	-5.2	19	40	16.6
18 SA	21	01	10	-622	+373.68	-06	09.8	-4.8	19	44	13.1
19 SU	20	50	26	-644	+370.50	-06	14.0	-4.2	19	48	09.7
20 MO	20	39	22	-664	+367.22	-06	17.7	-3.7	19	52	06.2
21 TU	20	27	57	-685	+363.84	-06	20.9	-3.2	19	56	02.8
22 WE	20	16	11	-706	+360.35	-06	23.5	-2.6	19	59	59.3
23 TH	20	04	04	-727	+356.76	-06	25.6	-2.1	20	03	55.9
24 FR	19	51	37	-747	+353.07	-06	27.0	-1.4	20	07	52.4
25 SA	19	38	51	-766	+349.29	-06	28.0	-1.0	20	11	49.0
26 SU	19	25	44	-787	+345.40	-06	28.3	-.3	20	15	45.6
27 MO	19	12	19	-805	+341.43	-06	28.1	+.2	20	19	42.1
28 TU	18	58	34	-825	+337.35	-06	27.3	+.8	20	23	38.7
29 WE	18	44	30	-844	+333.19	-06	25.9	+1.4	20	27	35.2
30 TH	18	30	08	-862	+328.93	-06	23.8	+2.1	20	31	31.8
31 FR	18	15	28	-880	+324.58	-06	21.2	+2.6	20	35	28.4
				-880	-4.35			+2.6			

Table 2e. Sun, 1992, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS				DAILY CHANGE (SEC)			
	°	'	''	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)		MIN	SEC	
AUG 1 SA	18	00	30		+320.15			-06	18.0	20 39 24.9
2 SU	17	45	15	-915	+315.63	-4.52	+3.9	-06	14.1	20 43 21.5
3 MO	17	29	42	-933	+311.02	-4.61	+4.4	-06	09.7	20 47 18.0
4 TU	17	13	52	-950	+306.33	-4.69	+5.1	-06	04.6	20 51 14.6
5 WE	16	57	45	-967	+301.56	-4.77	+5.8	-05	58.8	20 55 11.1
6 TH	16	41	22	-983	+296.70	-4.86	+6.3	-05	52.5	20 59 07.7
7 FR	16	24	44	-998	+291.77	-4.93	+7.0	-05	45.5	21 03 04.2
8 SA	16	07	49	-1015	+286.76	-5.01	+7.5	-05	38.0	21 07 00.8
9 SU	15	50	39	-1030	+281.67	-5.09	+8.2	-05	29.8	21 10 57.4
10 MO	15	33	13	-1046	+276.51	-5.16	+8.7	-05	21.1	21 14 53.9
11 TU	15	15	33	-1060	+271.27	-5.24	+9.4	-05	11.7	21 18 50.5
12 WE	14	57	38	-1075	+265.97	-5.30	+9.9	-05	01.8	21 22 47.0
13 TH	14	39	29	-1089	+260.59	-5.38	+10.4	-04	51.4	21 26 43.6
14 FR	14	21	06	-1103	+255.14	-5.45	+11.1	-04	40.3	21 30 40.1
15 SA	14	02	30	-1116	+249.63	-5.51	+11.5	-04	28.8	21 34 36.7
16 SU	13	43	39	-1131	+244.04	-5.59	+12.1	-04	16.7	21 38 33.2
17 MO	13	24	36	-1143	+238.40	-5.64	+12.6	-04	04.1	21 42 29.8
18 TU	13	05	20	-1156	+232.69	-5.71	+13.1	-03	51.0	21 46 26.3
19 WE	12	45	51	-1169	+226.92	-5.77	+13.6	-03	37.4	21 50 22.9
20 TH	12	26	10	-1181	+221.09	-5.83	+14.0	-03	23.4	21 54 19.4
21 FR	12	06	17	-1193	+215.20	-5.89	+14.6	-03	08.8	21 58 16.0
22 SA	11	46	13	-1204	+209.25	-5.95	+14.9	-02	53.9	22 02 12.5
23 SU	11	25	57	-1216	+203.24	-6.01	+15.4	-02	38.5	22 06 09.1
24 MO	11	05	30	-1227	+197.19	-6.05	+15.8	-02	22.7	22 10 05.7
25 TU	10	44	53	-1237	+191.08	-6.11	+16.3	-02	06.4	22 14 02.2
26 WE	10	24	05	-1248	+184.91	-6.17	+16.6	-01	49.8	22 17 58.8
27 TH	10	03	08	-1257	+178.71	-6.20	+17.0	-01	32.8	22 21 55.3
28 FR	09	42	01	-1267	+172.45	-6.26	+17.3	-01	15.5	22 25 51.9
29 SA	09	20	44	-1277	+166.14	-6.31	+17.8	-00	57.7	22 29 48.4
30 SU	08	59	19	-1285	+159.80	-6.34	+18.0	-00	39.7	22 33 45.0
31 MO	08	37	45	-1294	+153.41	-6.39	+18.4	-00	21.3	22 37 41.5
				-1294		-6.39	+18.4			

Table 2e. Sun, 1992, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME			
	DEGREES		DAILY CHANGE (SEC)	MILS		MIN	SEC	DAILY CHANGE (SEC)	HR	MIN	SEC
	°	'		MILS	DAILY CHANGE (MILS)						
SEP 1 TU	08	16 03		+146.98		-00	02.5		22	41	38.1
2 WE	07	54 13	-1310	+140.51	-6.47	00	16.6	+19.1	22	45	34.6
3 TH	07	32 16	-1317	+134.00	-6.51	00	35.9	+19.3	22	49	31.2
4 FR	07	10 11	-1325	+127.46	-6.54	00	55.5	+19.6	22	53	27.8
5 SA	06	48 00	-1331	+120.89	-6.57	01	15.4	+19.9	22	57	24.3
6 SU	06	25 42	-1338	+114.28	-6.61	01	35.6	+20.2	23	01	20.9
7 MO	06	03 17	-1345	+107.64	-6.64	01	55.9	+20.3	23	05	17.4
8 TU	05	40 47	-1350	+100.97	-6.67	02	16.5	+20.6	23	09	14.0
9 WE	05	18 11	-1356	+94.28	-6.69	02	37.3	+20.8	23	13	10.5
10 TH	04	55 30	-1361	+87.56	-6.72	02	58.2	+20.9	23	17	07.1
11 FR	04	32 44	-1366	+80.81	-6.75	03	19.2	+21.0	23	21	03.6
12 SA	04	09 53	-1371	+74.04	-6.77	03	40.4	+21.2	23	25	00.2
13 SU	03	46 58	-1375	+67.25	-6.79	04	01.7	+21.3	23	28	56.7
14 MO	03	23 58	-1380	+60.43	-6.82	04	23.0	+21.3	23	32	53.3
15 TU	03	00 55	-1383	+53.60	-6.83	04	44.4	+21.4	23	36	49.8
16 WE	02	37 48	-1387	+46.76	-6.84	05	05.9	+21.5	23	40	46.4
17 TH	02	14 38	-1390	+39.89	-6.87	05	27.3	+21.4	23	44	42.9
18 FR	01	51 26	-1392	+33.02	-6.87	05	48.7	+21.4	23	48	39.5
19 SA	01	28 11	-1395	+26.13	-6.89	06	10.1	+21.4	23	52	36.0
20 SU	01	04 53	-1398	+19.22	-6.91	06	31.4	+21.3	23	56	32.6
21 MO	00	41 34	-1399	+12.32	-6.90	06	52.6	+21.2	00	00	29.2
22 TU	00	18 13	-1401	+5.40	-6.92	07	13.8	+21.2	00	04	25.7
23 WE	-00	05 09	-1402	-1.53	-6.93	07	34.8	+21.0	00	08	22.3
24 TH	-00	28 32	-1403	-8.45	-6.92	07	55.6	+20.8	00	12	18.8
25 FR	-00	51 55	-1403	-15.38	-6.93	08	16.4	+20.8	00	16	15.4
26 SA	-01	15 18	-1403	-22.31	-6.93	08	36.9	+20.5	00	20	11.9
27 SU	-01	38 40	-1402	-29.23	-6.92	08	57.2	+20.3	00	24	08.5
28 MO	-02	02 03	-1403	-36.16	-6.93	09	17.4	+20.2	00	28	05.0
29 TU	-02	25 23	-1400	-43.08	-6.92	09	37.3	+19.9	00	32	01.6
30 WE	-02	48 43	-1400	-49.99	-6.91	09	57.0	+19.7	00	35	58.1
			-1400		-6.91			+19.7			

Table 2e. Sun, 1992, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE		APPARENT DECLINATION				EQUATION OF TIME		SIDEREAL TIME		
		DEGREES		MILS						
		° ' "	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN	SEC	DAILY CHANGE (SEC)	HR	MIN SEC
OCT	1 TH	-03 12 01		-56.89		10	16.4		00	39 54.7
	2 FR	-03 35 16	-1395	-63.78	-6.89	10	35.6	+19.2	00	43 51.2
	3 SA	-03 58 29	-1393	-70.66	-6.88	10	54.4	+18.8	00	47 47.8
	4 SU	-04 21 39	-1390	-77.53	-6.87	11	13.0	+18.6	00	51 44.3
	5 MO	-04 44 46	-1387	-84.38	-6.85	11	31.2	+18.2	00	55 40.9
	6 TU	-05 07 50	-1384	-91.21	-6.83	11	49.0	+17.8	00	59 37.5
	7 WE	-05 30 49	-1379	-98.02	-6.81	12	06.5	+17.5	01	03 34.0
	8 TH	-05 53 44	-1375	-104.81	-6.79	12	23.6	+17.1	01	07 30.6
	9 FR	-06 16 34	-1370	-111.58	-6.77	12	40.3	+16.7	01	11 27.1
	10 SA	-06 39 20	-1366	-118.32	-6.74	12	56.5	+16.2	01	15 23.6
	11 SU	-07 02 00	-1360	-125.04	-6.72	13	12.3	+15.8	01	19 20.2
	12 MO	-07 24 34	-1354	-131.72	-6.68	13	27.6	+15.3	01	23 16.7
	13 TU	-07 47 03	-1349	-138.39	-6.67	13	42.4	+14.8	01	27 13.3
	14 WE	-08 09 25	-1342	-145.01	-6.62	13	56.7	+14.3	01	31 09.8
	15 TH	-08 31 40	-1335	-151.60	-6.59	14	10.4	+13.7	01	35 06.4
	16 FR	-08 53 48	-1328	-158.16	-6.56	14	23.5	+13.1	01	39 03.0
	17 SA	-09 15 49	-1321	-164.69	-6.53	14	36.1	+12.6	01	42 59.5
	18 SU	-09 37 41	-1312	-171.17	-6.48	14	48.0	+11.9	01	46 56.1
	19 MO	-09 59 26	-1305	-177.61	-6.44	14	59.3	+11.3	01	50 52.6
	20 TU	-10 21 02	-1296	-184.01	-6.40	15	10.0	+10.7	01	54 49.2
	21 WE	-10 42 28	-1286	-190.36	-6.35	15	20.0	+10.0	01	58 45.8
	22 TH	-11 03 46	-1278	-196.67	-6.31	15	29.3	+9.3	02	02 42.3
	23 FR	-11 24 53	-1267	-202.93	-6.26	15	38.0	+8.7	02	06 38.8
	24 SA	-11 45 50	-1257	-209.14	-6.21	15	45.9	+7.9	02	10 35.4
	25 SU	-12 06 36	-1246	-215.29	-6.15	15	53.1	+7.2	02	14 31.9
	26 MO	-12 27 12	-1236	-221.39	-6.10	15	59.6	+6.5	02	18 28.5
	27 TU	-12 47 35	-1223	-227.43	-6.04	16	05.3	+5.7	02	22 25.1
	28 WE	-13 07 47	-1212	-233.42	-5.99	16	10.4	+5.1	02	26 21.6
	29 TH	-13 27 46	-1199	-239.34	-5.92	16	14.6	+4.2	02	30 18.2
	30 FR	-13 47 33	-1187	-245.20	-5.86	16	18.2	+3.6	02	34 14.7
	31 SA	-14 07 06	-1173	-250.99	-5.79	16	20.9	+2.7	02	38 11.3
			-1173		-5.79			+2.7		

Table 2e. Sun, 1992, for Zero Hours Universal Time (GMT)—Continued

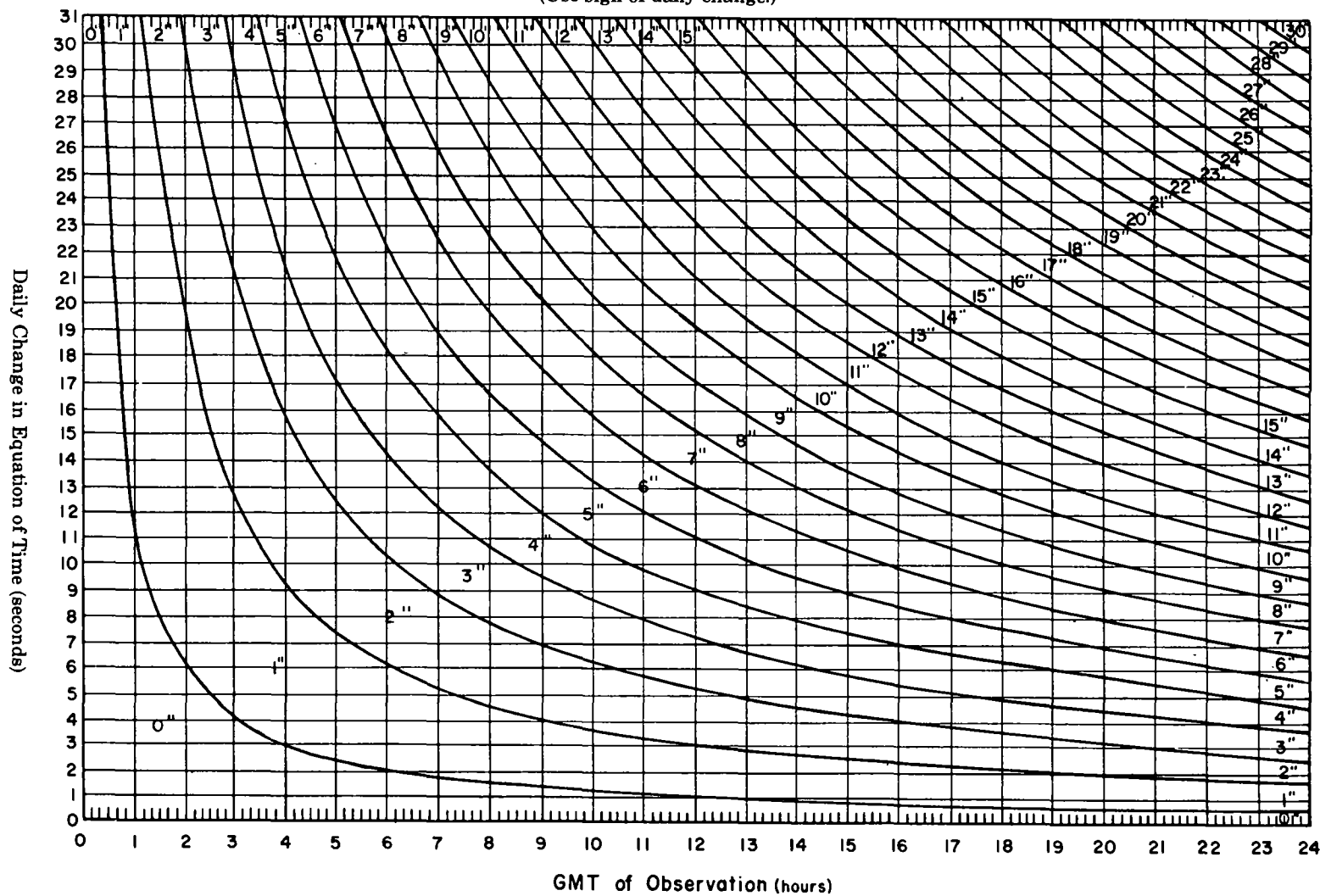
GREENWICH DATE		APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME					
		DEGREES		MILS										
			DAILY CHANGE (SEC)		DAILY CHANGE (MILS)									
		°	'	"		MILS		MIN	SEC	DAILY CHANGE (SEC)	HR	MIN	SEC	
NOV	1	SU	-14	26	26	-1146	-256.72		16	22.9		02	42	07.8
	2	MO	-14	45	32	-1131	-262.38	-5.66	16	24.1	+1.2	02	46	04.4
	3	TU	-15	04	23	-1117	-267.97	-5.59	16	24.5	+0.4	02	50	01.0
	4	WE	-15	23	00	-1101	-273.48	-5.51	16	24.1	-0.4	02	53	57.5
	5	TH	-15	41	21	-1086	-278.92	-5.44	16	22.9	-1.2	02	57	54.1
	6	FR	-15	59	27	-1069	-284.28	-5.36	16	20.9	-2.0	03	01	50.6
	7	SA	-16	17	16	-1054	-289.56	-5.28	16	18.1	-2.8	03	05	47.2
	8	SU	-16	34	50	-1036	-294.77	-5.21	16	14.4	-3.7	03	09	43.7
	9	MO	-16	52	06	-1019	-299.88	-5.11	16	09.9	-4.5	03	13	40.3
	10	TU	-17	09	05	-1002	-304.91	-5.03	16	04.6	-5.3	03	17	36.8
	11	WE	-17	25	47	-984	-309.86	-4.95	15	58.4	-6.2	03	21	33.4
	12	TH	-17	42	11	-965	-314.72	-4.86	15	51.4	-7.0	03	25	29.9
	13	FR	-17	58	16	-947	-319.49	-4.77	15	43.5	-7.9	03	29	26.5
	14	SA	-18	14	03	-928	-324.16	-4.67	15	34.8	-8.7	03	33	23.1
	15	SU	-18	29	31	-908	-328.75	-4.59	15	25.2	-9.6	03	37	19.6
	16	MO	-18	44	39	-889	-333.23	-4.48	15	14.7	-10.5	03	41	16.2
	17	TU	-18	59	28	-868	-337.62	-4.39	15	03.4	-11.3	03	45	12.7
	18	WE	-19	13	56	-847	-341.91	-4.29	14	51.2	-12.2	03	49	09.3
	19	TH	-19	28	03	-826	-346.09	-4.18	14	38.2	-13.0	03	53	05.8
	20	FR	-19	41	49	-805	-350.17	-4.08	14	24.3	-13.9	03	57	02.4
	21	SA	-19	55	14	-783	-354.14	-3.97	14	09.6	-14.7	04	00	58.9
	22	SU	-20	08	17	-761	-358.01	-3.87	13	54.1	-15.5	04	04	55.5
	23	MO	-20	20	58	-739	-361.77	-3.76	13	37.8	-16.3	04	08	52.1
	24	TU	-20	33	17	-715	-365.42	-3.65	13	20.6	-17.2	04	12	48.6
	25	WE	-20	45	12	-693	-368.95	-3.53	13	02.8	-17.8	04	16	45.2
	26	TH	-20	56	45	-668	-372.37	-3.42	12	44.1	-18.7	04	20	41.7
	27	FR	-21	07	53	-645	-375.67	-3.30	12	24.8	-19.3	04	24	38.3
	28	SA	-21	18	38	-621	-378.85	-3.18	12	04.7	-20.1	04	28	34.9
	29	SU	-21	28	59	-596	-381.92	-3.07	11	43.9	-20.8	04	32	31.4
	30	MO	-21	38	55	-596	-384.86	-2.94	11	22.5	-21.4	04	36	28.0
						-596		-2.94			-21.4			

Table 2e. Sun, 1992, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME			SIDEREAL TIME		
	DEGREES		MILS				DAILY CHANGE (SEC)			
	°	'	''	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)		MIN	SEC	HR MIN SEC
DEC 1 TU	-21	48	27		-387.69			11	00.4	04 40 24.5
2 WE	-21	57	33	-546	-390.39	-2.70	-22.7	10	37.7	04 44 21.1
3 TH	-22	06	14	-521	-392.96	-2.57	-23.4	10	14.3	04 48 17.6
4 FR	-22	14	30	-496	-395.41	-2.45	-23.9	09	50.4	04 52 14.2
5 SA	-22	22	20	-470	-397.73	-2.32	-24.4	09	26.0	04 56 10.7
6 SU	-22	29	43	-443	-399.92	-2.19	-25.0	09	01.0	05 00 07.3
7 MO	-22	36	40	-417	-401.98	-2.06	-25.5	008	35.5	05 04 03.8
8 TU	-22	43	11	-391	-403.91	-1.93	-26.0	008	09.5	05 08 00.4
9 WE	-22	49	15	-364	-405.70	-1.79	-26.5	007	43.0	05 11 57.0
10 TH	-22	54	52	-337	-407.37	-1.67	-26.8	007	16.2	05 15 53.5
11 FR	-23	00	02	-310	-408.90	-1.53	-27.3	006	48.9	05 19 50.1
12 SA	-23	04	44	-282	-410.29	-1.39	-27.7	006	21.2	05 23 46.7
13 SU	-23	09	00	-256	-411.56	-1.27	-28.1	005	53.1	05 27 43.2
14 MO	-23	12	47	-227	-412.68	-1.12	-28.4	005	24.7	05 31 39.8
15 TU	-23	16	07	-200	-413.66	-.98	-28.7	004	56.0	05 35 36.3
16 WE	-23	18	59	-172	-414.51	-.85	-29.0	004	27.0	05 39 32.9
17 TH	-23	21	23	-144	-415.22	-.71	-29.2	003	57.8	05 43 29.4
18 FR	-23	23	19	-116	-415.80	-.58	-29.4	003	28.4	05 47 26.0
19 SA	-23	24	47	-88	-416.23	-.43	-29.6	002	58.8	05 51 22.6
20 SU	-23	25	47	-60	-416.53	-.30	-29.8	002	29.0	05 55 19.1
21 MO	-23	26	18	-31	-416.68	-.15	-29.9	001	59.1	05 59 15.7
22 TU	-23	26	21	-3	-416.70	-.02	-29.9	001	29.2	06 03 12.2
23 WE	-23	25	56	+25	-416.57	+.13	-30.0	000	59.2	06 07 08.8
24 TH	-23	25	02	+54	-416.31	+.26	-29.9	000	29.3	06 11 05.4
25 FR	-23	23	40	+82	-415.90	+.41	-29.9	-00	00.6	06 15 01.9
26 SA	-23	21	51	+109	-415.36	+.54	-29.9	-00	30.5	06 18 58.5
27 SU	-23	19	32	+139	-414.68	+.68	-29.7	-01	00.2	06 22 55.0
28 MO	-23	16	46	+166	-413.86	+.82	-29.5	-01	29.7	06 26 51.6
29 TU	-23	13	32	+194	-412.90	+.96	-29.3	-01	59.0	06 30 48.2
30 WE	-23	09	50	+222	-411.80	+1.10	-29.2	-02	28.2	06 34 44.7
31 TH	-23	05	40	+250	-410.57	+1.23	-28.8	-02	57.0	06 38 41.3
32 FR	-23	01	03	+277	-409.20	+1.37	-28.5	-03	25.5	06 42 37.8

EQUATION OF TIME—PARTIAL DAY IN SECONDS

(Use sign of daily change.)



Note. Enter table with value of daily change to the nearest second and of GMT to the nearest 10 minutes. Do *not* interpolate for values more accurate than the nearest second.

Table 3. Equation of Time Graph

Table 4. Correction to Greenwich Mean Time Interval to Obtain Greenwich Sidereal Time Interval

GMT	0 ^h	1 ^h	2 ^h	3 ^h	4 ^h	5 ^h	6 ^h	7 ^h	8 ^h	9 ^h	10 ^h	11 ^h
m	m s	m s	m s	m s	m s	m s	m s	m s	m s	m s	m s	m s
0	0 0.0	0 9.9	0 19.7	0 29.6	0 39.4	0 49.3	0 59.1	1 9.0	1 18.9	1 28.7	1 38.6	1 48.4
1	0.2	10.0	19.9	29.7	39.6	49.4	59.3	9.2	19.0	28.9	38.7	48.6
2	0.3	10.2	20.0	29.9	39.8	49.6	59.5	9.3	19.2	29.0	38.9	48.8
3	0.5	10.3	20.2	30.1	39.9	49.8	59.6	9.5	19.3	29.2	39.1	48.9
4	0.7	10.5	20.4	30.2	40.1	49.9	59.8	9.7	19.5	29.4	39.2	49.1
5	0 0.8	0 10.7	0 20.5	0 30.4	0 40.2	0 50.1	1 0.0	0 9.8	1 19.7	1 29.5	1 39.4	1 49.2
6	1.0	10.8	20.7	30.6	40.4	50.3	0.1	10.0	19.8	29.7	39.6	49.4
7	1.2	11.0	20.9	30.7	40.6	50.4	0.3	10.1	20.0	29.9	39.7	49.6
8	1.3	11.2	21.0	30.9	40.7	50.6	0.5	10.3	20.2	30.0	39.9	49.7
9	1.5	11.3	21.2	31.0	40.9	50.8	0.6	10.5	20.3	30.2	40.0	49.9
10	0 1.6	0 11.5	0 21.4	0 31.2	0 41.1	0 50.9	1 0.8	1 10.6	1 20.5	1 30.4	1 40.2	1 50.1
11	1.8	11.7	21.5	31.4	41.2	51.1	0.9	10.8	20.7	30.5	40.4	50.2
12	2.0	11.8	21.7	31.5	41.4	51.3	1.1	11.0	20.8	30.7	40.5	50.4
13	2.1	12.0	21.8	31.7	41.6	51.4	1.3	11.1	21.0	30.8	40.7	50.6
14	2.3	12.2	22.0	31.9	41.7	51.6	1.4	11.3	21.2	31.0	40.9	50.7
15	0 2.5	0 12.3	0 22.2	0 32.0	0 41.9	0 51.7	1 1.6	1 11.5	1 21.3	1 31.2	1 41.0	1 50.9
16	2.6	12.5	22.3	32.2	42.1	51.9	1.8	11.6	21.5	31.3	41.2	51.0
17	2.8	12.6	22.5	32.4	42.2	52.1	1.9	11.8	21.6	31.5	41.4	51.2
18	3.0	12.8	22.7	32.5	42.4	52.2	2.1	12.0	21.8	31.7	41.5	51.4
19	3.1	13.0	22.8	32.7	42.5	52.4	2.3	12.1	22.0	31.8	41.7	51.5
20	0 3.3	0 13.1	0 23.0	0 32.9	0 42.7	0 52.6	1 2.4	1 12.3	1 22.1	1 32.0	1 41.8	1 51.7
21	3.4	13.3	23.2	33.0	42.9	52.7	2.6	12.4	22.3	32.2	42.0	51.9
22	3.6	13.5	23.3	33.2	43.0	52.9	2.8	12.6	22.5	32.3	42.2	52.0
23	3.8	13.6	23.5	33.3	43.2	53.1	2.9	12.8	22.6	32.5	42.3	52.2
24	3.9	13.8	23.7	33.5	43.4	53.2	3.1	12.9	22.8	32.7	42.5	52.4
25	0 4.1	0 14.0	0 23.8	0 33.7	0 43.5	0 53.4	1 3.2	1 13.1	1 23.0	1 32.8	1 42.7	1 52.5
26	4.3	14.1	24.0	33.8	43.7	53.6	3.4	13.3	23.1	33.0	42.8	52.7
27	4.4	14.3	24.1	34.0	43.9	53.7	3.6	13.4	23.3	33.1	43.0	52.9
28	4.6	14.5	24.3	34.2	44.0	53.9	3.7	13.6	23.5	33.3	43.2	53.0
29	4.8	14.6	24.5	34.3	44.2	54.0	3.9	13.8	23.6	33.5	43.3	53.2
30	0 4.9	0 14.8	0 24.6	0 34.5	0 44.4	0 54.2	1 4.1	1 13.9	1 23.8	1 33.6	1 43.5	1 53.3
31	5.1	14.9	24.8	34.7	44.5	54.4	4.2	14.1	23.9	33.8	43.7	53.5
32	5.3	15.1	25.0	34.8	44.7	54.5	4.4	14.3	24.1	34.0	43.8	53.7
33	5.4	15.3	25.1	35.0	44.8	54.7	4.6	14.4	24.3	34.1	44.0	53.8
34	5.6	15.4	25.3	35.2	45.0	54.9	4.7	14.6	24.4	34.3	44.2	54.0
35	0 5.8	0 15.6	0 25.5	0 35.3	0 45.2	0 55.0	1 4.9	1 14.7	1 24.6	1 34.5	1 44.3	1 54.2
36	5.9	15.8	25.6	35.5	45.3	55.2	5.1	14.9	24.8	34.6	44.5	54.3
37	6.1	15.9	25.8	35.6	45.5	55.4	5.2	15.1	24.9	34.8	44.6	54.5
38	6.2	16.1	26.0	35.8	45.7	55.5	5.4	15.2	25.1	35.0	44.8	54.7
39	6.4	16.3	26.1	36.0	45.8	55.7	5.5	15.4	25.3	35.1	45.0	54.8
40	0 6.6	0 16.4	0 26.3	0 36.1	0 46.0	0 55.9	1 5.7	1 15.6	1 25.4	1 35.3	1 45.1	1 55.0
41	6.7	16.6	26.4	36.3	46.2	56.0	5.9	15.7	25.6	35.4	45.3	55.2
42	6.9	16.8	26.6	36.5	46.3	56.2	6.0	15.9	25.8	35.6	45.5	55.3
43	7.1	16.9	26.8	36.6	46.5	56.3	6.2	16.1	25.9	35.8	45.6	55.5
44	7.2	17.1	26.9	36.8	46.7	56.5	6.4	16.2	26.1	35.9	45.8	55.6
45	0 7.4	0 17.2	0 27.1	0 37.0	0 46.8	0 56.7	1 6.5	1 16.4	1 26.2	1 36.1	1 46.0	1 55.8
46	7.6	17.4	27.3	37.1	47.0	56.8	6.7	16.6	26.4	36.3	46.1	56.0
47	7.7	17.6	27.4	37.3	47.1	57.0	6.9	16.7	26.6	36.4	46.3	56.1
48	7.9	17.7	27.6	37.5	47.3	57.2	7.0	16.9	26.7	36.6	46.4	56.3
49	8.0	17.9	27.8	37.6	47.5	57.3	7.2	17.0	26.9	36.8	46.6	56.5
50	0 8.2	0 18.1	0 27.9	0 37.8	0 47.6	0 57.5	1 7.4	1 17.2	1 27.1	1 36.9	1 46.8	1 56.6
51	8.4	18.2	28.1	37.9	47.8	57.7	7.5	17.4	27.2	37.1	46.9	56.8
52	8.5	18.4	28.3	38.1	48.0	57.8	7.7	17.5	27.4	37.3	47.1	57.0
53	8.7	18.6	28.4	38.3	48.1	58.0	7.8	17.7	27.6	37.4	47.3	57.1
54	8.9	18.7	28.6	38.4	48.3	58.2	8.0	17.9	27.7	37.6	47.4	57.3
55	0 9.0	0 18.9	0 28.7	0 38.6	0 48.5	0 58.3	1 8.2	1 18.0	1 27.9	1 37.7	1 47.6	1 57.5
56	9.2	19.1	28.9	38.8	48.6	58.5	8.3	18.2	28.1	37.9	47.8	57.6
57	9.4	19.2	29.1	38.9	48.8	58.6	8.5	18.4	28.2	38.1	47.9	57.8
58	9.5	19.4	29.2	39.1	49.0	58.8	8.7	18.5	28.4	38.2	48.1	57.9
59	9.7	19.5	29.4	39.3	49.1	59.0	8.8	18.7	28.5	38.4	48.3	58.1

Table 4. Correction to Greenwich Mean Time Interval to Obtain Greenwich Sidereal Time Interval—Continued

GMT	12 ^h	13 ^h	14 ^h	15 ^h	16 ^h	17 ^h	18 ^h	19 ^h	20 ^h	21 ^h	22 ^h	23 ^h
m	m s	m s	m s	m s	m s	m s	m s	m s	m s	m s	m s	m s
0	1 58.3	2 8.1	2 18.0	2 27.8	2 37.7	2 47.6	2 57.4	3 7.3	3 17.1	3 27.0	3 36.8	3 46.7
1	58.4	8.3	18.2	28.0	37.9	47.7	57.6	7.4	17.3	27.2	37.0	46.9
2	58.6	8.5	18.3	28.2	38.0	47.9	57.7	7.6	17.5	27.3	37.2	47.0
3	58.8	8.6	18.5	28.3	38.2	48.1	57.9	7.8	17.6	27.5	37.3	47.2
4	58.9	8.8	18.6	28.5	38.4	48.2	58.1	7.9	17.8	27.6	37.5	47.4
5	1 59.1	2 9.0	2 18.8	2 28.7	2 38.5	2 48.4	2 58.2	3 8.1	3 18.0	3 27.8	3 37.7	3 47.5
6	59.3	9.1	19.0	28.8	38.7	48.5	58.4	8.3	18.1	28.0	37.8	47.7
7	59.4	9.3	19.1	29.0	38.9	48.7	58.6	8.4	18.3	28.1	38.0	47.8
8	59.6	9.4	19.3	29.2	39.0	48.9	58.7	8.6	18.4	28.3	38.2	48.0
9	59.8	9.6	19.5	29.3	39.2	49.0	58.9	8.8	18.6	28.5	38.3	48.2
10	1 59.9	2 9.8	2 19.6	2 29.5	2 39.3	2 49.2	2 59.1	3 8.9	3 18.8	3 28.6	3 38.5	3 48.3
11	2 0.1	9.9	19.8	29.7	39.5	49.4	59.2	9.1	18.9	28.8	38.6	48.5
12	0.2	10.1	20.0	29.8	39.7	49.5	59.4	9.2	19.1	29.0	38.8	48.7
13	0.4	10.3	20.1	30.0	39.8	49.7	59.6	9.4	19.3	29.1	39.0	48.8
14	0.6	10.4	20.3	30.1	40.0	49.9	59.7	9.6	19.4	29.3	39.1	49.0
15	2 0.7	2 10.6	2 20.5	2 30.3	2 40.2	2 50.0	2 59.9	3 9.7	3 19.6	3 29.4	3 39.3	3 49.2
16	0.9	10.8	20.6	30.5	40.3	50.2	3 0.0	9.9	19.8	29.6	39.5	49.3
17	1.1	10.9	20.8	30.6	40.5	50.4	0.2	10.1	19.9	29.8	39.6	49.5
18	1.2	11.1	20.9	30.8	40.7	50.5	0.4	10.2	20.1	29.9	39.8	49.7
19	1.4	11.3	21.1	31.0	40.8	50.7	0.5	10.4	20.3	30.1	40.0	49.8
20	2 1.6	2 11.4	2 21.3	2 31.1	2 41.0	2 50.8	3 0.7	3 10.6	3 20.4	3 30.3	3 40.1	3 50.0
21	1.7	11.6	21.4	31.3	41.2	51.0	0.9	10.7	20.6	30.4	40.3	50.1
22	1.9	11.7	21.6	31.5	41.3	51.2	1.0	10.9	20.7	30.6	40.5	50.3
23	2.1	11.9	21.8	31.6	41.5	51.3	1.2	11.1	20.9	30.8	40.6	50.5
24	2.2	12.1	21.9	31.8	41.6	51.5	1.4	11.2	21.1	30.9	40.8	50.6
25	2 2.4	2 12.2	2 22.1	2 32.0	2 41.8	2 51.7	3 1.5	3 11.4	3 21.2	3 31.1	3 40.9	3 50.8
26	2.5	12.4	22.3	32.1	42.0	51.8	1.7	11.5	21.4	31.3	41.1	51.0
27	2.7	12.6	22.4	32.3	42.1	52.0	1.9	11.7	21.6	31.4	41.3	51.1
28	2.9	12.7	22.6	32.4	42.3	52.2	2.0	11.9	21.7	31.6	41.4	51.3
29	3.0	12.9	22.8	32.6	42.5	52.3	2.2	12.0	21.9	31.8	41.6	51.5
30	2 3.2	2 13.1	2 22.9	2 32.8	2 42.6	2 52.5	3 2.3	3 12.2	3 22.1	3 31.9	3 41.8	3 51.6
31	3.4	13.2	23.1	32.9	42.8	52.7	2.5	12.4	22.2	32.1	41.9	51.8
32	3.5	13.4	23.2	33.1	43.0	52.8	2.7	12.5	22.4	32.2	42.1	52.0
33	3.7	13.6	23.4	33.3	43.1	53.0	2.8	12.7	22.6	32.4	42.3	52.1
34	3.9	13.7	23.6	33.4	43.3	53.1	3.0	12.9	22.7	32.6	42.4	52.3
35	2 4.0	2 13.9	2 23.7	2 33.6	2 43.5	2 53.3	3 3.2	3 13.0	3 22.9	3 32.7	3 42.6	3 52.4
36	4.2	14.0	23.9	33.8	43.6	53.5	3.3	13.2	23.0	32.9	42.8	52.6
37	4.4	14.2	24.1	33.9	43.8	53.6	3.5	13.4	23.2	33.1	42.9	52.8
38	4.5	14.4	24.2	34.1	43.9	53.8	3.7	13.5	23.4	33.2	43.1	52.9
39	4.7	14.5	24.4	34.3	44.1	54.0	3.8	13.7	23.5	33.4	43.2	53.1
40	2 4.8	2 14.7	2 24.6	2 34.4	2 44.3	2 54.1	3 4.0	3 13.8	3 23.7	3 33.6	3 43.4	3 53.3
41	5.0	14.9	24.7	34.6	44.4	54.3	4.2	14.0	23.9	33.7	43.6	53.4
42	5.2	15.0	24.9	34.7	44.6	54.5	4.3	14.2	24.0	33.9	43.7	53.6
43	5.3	15.2	25.1	34.9	44.8	54.6	4.5	14.3	24.2	34.0	43.9	53.8
44	5.5	15.4	25.2	35.1	44.9	54.8	4.6	14.5	24.4	34.2	44.1	53.9
45	2 5.7	2 15.5	2 25.4	2 35.2	2 45.1	2 55.0	3 4.8	3 14.7	3 24.5	3 34.4	3 44.2	3 54.1
46	5.8	15.7	25.5	35.4	45.3	55.1	5.0	14.8	24.7	34.5	44.4	54.3
47	6.0	15.9	25.7	35.6	45.4	55.3	5.1	15.0	24.8	34.7	44.6	54.4
48	6.2	16.0	25.9	35.7	45.6	55.4	5.3	15.2	25.0	34.9	44.7	54.6
49	6.3	16.2	26.0	35.9	45.8	55.6	5.5	15.3	25.2	35.0	44.9	54.7
50	2 6.5	2 16.3	2 26.2	2 36.1	2 45.9	2 55.8	3 5.6	3 15.5	3 25.3	3 35.2	3 45.1	3 54.9
51	6.7	16.5	26.4	36.2	46.1	55.9	5.8	15.7	25.5	35.4	45.2	55.1
52	6.8	16.7	26.5	36.4	46.2	56.1	6.0	15.8	25.7	35.5	45.4	55.2
53	7.0	16.8	26.7	36.6	46.4	56.3	6.1	16.0	25.8	35.7	45.5	55.4
54	7.1	17.0	26.9	36.7	46.6	56.4	6.3	16.1	26.0	35.9	45.7	55.6
55	2 7.3	2 17.2	2 27.0	2 36.9	2 46.7	2 56.6	3 6.5	3 16.3	3 26.2	3 36.0	3 45.9	3 55.7
56	7.5	17.3	27.2	37.0	46.9	56.8	6.6	16.5	26.3	36.2	46.0	55.9
57	7.6	17.5	27.4	37.2	47.1	56.9	6.8	16.6	26.5	36.4	46.2	56.1
58	7.8	17.7	27.5	37.4	47.2	57.1	6.9	16.8	26.7	36.5	46.4	56.2
59	8.0	17.8	27.7	37.5	47.4	57.3	7.1	17.0	26.8	36.7	46.5	56.4

Table 5a. Conversion of Time to Arc

Time	Arc		Time	Arc			Time	Arc			Time	Arc		
Hours	°	Mils	Min	°	'	Mils	Min	°	'	Mils	Min	°	'	Mils
1	15	266.67	1	0	15	4.44	21	5	15	93.33	41	10	15	182.22
2	30	533.33	2	0	30	8.89	22	5	30	97.78	42	10	30	186.67
3	45	800.00	3	0	45	13.33	23	5	45	102.22	43	10	45	191.11
4	60	1066.67	4	1	00	17.78	24	6	00	106.67	44	11	00	195.56
5	75	1333.33	5	1	15	22.22	25	6	15	111.11	45	11	15	200.00
6	90	1600.00	6	1	30	26.67	26	6	30	115.56	46	11	30	204.44
7	105	1866.67	7	1	45	31.11	27	6	45	120.00	47	11	45	208.89
8	120	2133.33	8	2	00	35.56	28	7	00	124.44	48	12	00	213.33
9	135	2400.00	9	2	15	40.00	29	7	15	128.89	49	12	15	217.78
10	150	2666.67	10	2	30	44.44	30	7	30	133.33	50	12	30	222.22
11	165	2933.33	11	2	45	48.89	31	7	45	137.78	51	12	45	226.67
12	180	3200.00	12	3	00	53.33	32	8	00	142.22	52	13	00	231.11
13	195	3466.67	13	3	15	57.78	33	8	15	146.67	53	13	15	235.56
14	210	3733.33	14	3	30	62.22	34	8	30	151.11	54	13	30	240.00
15	225	4000.00	15	3	45	66.67	35	8	45	155.56	55	13	45	244.44
16	240	4266.67	16	4	00	71.11	36	9	00	160.00	56	14	00	248.89
17	255	4533.33	17	4	15	75.56	37	9	15	164.44	57	14	15	253.33
18	270	4800.00	18	4	30	80.00	38	9	30	168.89	58	14	30	257.78
19	285	5066.67	19	4	45	84.44	39	9	45	173.33	59	14	45	262.22
20	300	5333.33	20	5	00	88.89	40	10	00	177.78	60	15	00	266.67
21	315	5600.00												
22	330	5866.67												
23	345	6133.33												
24	360	6400.00												

Time				Arc				Time				Arc			
Sec	'	"	Mils	Sec	'	"	Mils	Sec	'	"	Mils	Sec	'	"	Mils
1	0	15	.07	16	4	00	1.19	31	7	45	2.30	46	11	30	3.41
2	0	30	.15	17	4	15	1.26	32	8	00	2.37	47	11	45	3.48
3	0	45	.22	18	4	30	1.33	33	8	15	2.44	48	12	00	3.56
4	1	00	.30	19	4	45	1.41	34	8	30	2.52	49	12	15	3.63
5	1	15	.37	20	5	00	1.48	35	8	45	2.59	50	12	30	3.70
6	1	30	.44	21	5	15	1.56	36	9	00	2.67	51	12	45	3.78
7	1	45	.52	22	5	30	1.63	37	9	15	2.74	52	13	00	3.85
8	2	00	.59	23	5	45	1.70	37	9	30	2.81	53	13	15	3.93
9	2	15	.67	24	6	00	1.78	39	9	45	2.89	54	13	30	4.00
10	2	30	.74	25	6	15	1.85	40	10	00	2.96	55	13	45	4.07
11	2	45	.81	26	6	30	1.93	41	10	15	3.04	56	14	00	4.15
12	3	00	.89	27	6	45	2.00	42	10	30	3.11	57	14	15	4.22
13	3	15	.96	28	7	00	2.07	43	10	45	3.19	58	14	30	4.30
14	3	30	1.04	29	7	15	2.15	44	11	00	3.26	59	14	45	4.37
15	3	45	1.11	30	7	30	2.22	45	11	15	3.33	60	15	00	4.44

Example: Time is 22 hours , 46 minutes, 37 seconds. Convert to arc.

22 hours time = 330° arc

46 minutes time = 11° 30' arc

37 seconds time = 9' 15" arc

22 h 46 M 37 S 341° 39' 15" arc

Table 5b. Conversion of Arc to Time

DEGREES						MINUTES		SECONDS								
•	h	m	•	h	m	•	h	m	•	s	•	s	•	s		
0	0	00	60	4	00	120	8	00	0	0 00	0	0.000	0.00	0.000	0.50	0.033
1	0	04	61	4	04	121	8	04	1	0 04	1	0.067	.01	.001	.51	.034
2	0	08	62	4	08	122	8	08	2	0 08	2	0.133	.02	.001	.52	.035
3	0	12	63	4	12	123	8	12	3	0 12	3	0.200	.03	.002	.53	.035
4	0	16	64	4	16	124	8	16	4	0 16	4	0.267	.04	.003	.54	.036
5	0	20	65	4	20	125	8	20	5	0 20	5	0.333	0.05	0.003	0.55	0.037
6	0	24	66	4	24	126	8	24	6	0 24	6	0.400	.06	.004	.56	.037
7	0	28	67	4	28	127	8	28	7	0 28	7	0.467	.07	.005	.57	.038
8	0	32	68	4	32	128	8	32	8	0 32	8	0.533	.08	.005	.58	.039
9	0	36	69	4	36	129	8	36	9	0 36	9	0.600	.09	.006	.59	.039
10	0	40	70	4	40	130	8	40	10	0 40	10	0.667	0.10	0.007	0.60	0.040
11	0	44	71	4	44	131	8	44	11	0 44	11	0.733	.11	.007	.61	.041
12	0	48	72	4	48	132	8	48	12	0 48	12	0.800	.12	.008	.62	.041
13	0	52	73	4	52	133	8	52	13	0 52	13	0.867	.13	.009	.63	.042
14	0	56	74	4	56	134	8	56	14	0 56	14	0.933	.14	.009	.64	.043
15	1	00	75	5	00	135	9	00	15	1 00	15	1.000	0.15	0.010	0.65	0.043
16	1	04	76	5	04	136	9	04	16	1 04	16	1.067	.16	.011	.66	.044
17	1	08	77	5	08	137	9	08	17	1 08	17	1.133	.17	.011	.67	.045
18	1	12	78	5	12	138	9	12	18	1 12	18	1.200	.18	.012	.68	.045
19	1	16	79	5	16	139	9	16	19	1 16	19	1.267	.19	.013	.69	.046
20	1	20	80	5	20	140	9	20	20	1 20	20	1.333	0.20	0.013	0.70	0.047
21	1	24	81	5	24	141	9	24	21	1 24	21	1.400	.21	.014	.71	.047
22	1	28	82	5	28	142	9	28	22	1 28	22	1.467	.22	.015	.72	.048
23	1	32	83	5	32	143	9	32	23	1 32	23	1.533	.23	.015	.73	.049
24	1	36	84	5	36	144	9	36	24	1 36	24	1.600	.24	.016	.74	.049
25	1	40	85	5	40	145	9	40	25	1 40	25	1.667	0.25	0.017	0.75	0.056
26	1	44	86	5	44	146	9	44	26	1 44	26	1.733	.26	.017	.76	.051
27	1	48	87	5	48	147	9	48	27	1 48	27	1.800	.27	.018	.77	.051
28	1	52	88	5	52	148	9	52	28	1 52	28	1.867	.28	.019	.78	.052
29	1	56	89	5	56	149	9	56	29	1 56	29	1.933	.29	.019	.79	.053
30	2	00	90	6	00	150	10	00	30	2 00	30	2.000	0.30	0.020	0.80	0.053
31	2	04	91	6	04	151	10	04	31	2 04	31	2.067	.31	.021	.81	.054
32	2	08	92	6	08	152	10	08	32	2 08	32	2.133	.32	.021	.82	.055
33	2	12	93	6	12	153	10	12	33	2 12	33	2.200	.33	.022	.83	.055
34	2	16	94	6	16	154	10	16	34	2 16	34	2.267	.34	.023	.84	.056
35	2	20	95	6	20	155	10	20	35	2 20	35	2.333	0.35	0.023	0.85	0.057
36	2	24	96	6	24	156	10	24	36	2 24	36	2.400	.36	.024	.86	.057
37	2	28	97	6	28	157	10	28	37	2 28	37	2.467	.37	.025	.87	.058
38	2	32	98	6	32	158	10	32	38	2 32	38	2.533	.38	.025	.88	.059
39	2	36	99	6	36	159	10	36	39	2 36	39	2.600	.39	.026	.89	.059
40	2	40	100	6	40	160	10	40	40	2 40	40	2.667	0.40	0.027	0.90	0.060
41	2	44	101	6	44	161	10	44	41	2 44	41	2.733	.41	.027	.91	.061
42	2	48	102	6	48	162	10	48	42	2 48	42	2.800	.42	.028	.92	.061
43	2	52	103	6	52	163	10	52	43	2 52	43	2.867	.43	.029	.93	.062
44	2	56	104	6	56	164	10	56	44	2 56	44	2.933	.44	.029	.94	.063
45	3	00	105	7	00	165	11	00	45	3 00	45	3.000	0.45	0.030	0.95	0.063
46	3	04	106	7	04	166	11	04	46	3 04	46	3.067	.46	.031	.96	.064
47	3	08	107	7	08	167	11	08	47	3 08	47	3.133	.47	.031	.97	.065
48	3	12	108	7	12	168	11	12	48	3 12	48	3.200	.48	.032	.98	.065
49	3	16	109	7	16	169	11	16	49	3 16	49	3.267	.49	.033	0.99	.066
50	3	20	110	7	20	170	11	20	50	3 20	50	3.333	0.50	0.033	1.00	0.067
51	3	24	111	7	24	171	11	24	51	3 24	51	3.400				
52	3	28	112	7	28	172	11	28	52	3 28	52	3.467				
53	3	32	113	7	32	173	11	32	53	3 32	53	3.533				
54	3	36	114	7	36	174	11	36	54	3 36	54	3.600				
55	3	40	115	7	40	175	11	40	55	3 40	55	3.667				
56	3	44	116	7	44	176	11	44	56	3 44	56	3.733				
57	3	48	117	7	48	177	11	48	57	3 48	57	3.800				
58	3	52	118	7	52	178	11	52	58	3 52	58	3.865				
59	3	56	119	7	56	179	11	56	59	3 56	59	3.933				

90° = 6h

180° = 12h

270° = 18h

Table 5c. Conversion of Degrees, Minutes, and Seconds to Mils

Degrees											
Deg	Mils	Deg	Mils	Deg	Mils	Deg	Mils	Deg	Mils	Deg	Mils
1	17.78	31	551.11	61	1084.44	91	1617.78	121	2151.11	151	2684.44
2	35.56	32	568.89	62	1102.22	92	1635.56	122	2168.89	152	2702.22
3	53.33	33	586.67	63	1120.00	93	1653.33	123	2186.67	153	2720.00
4	71.11	34	604.44	64	1137.78	94	1671.11	124	2204.44	154	2737.78
5	88.89	35	622.22	65	1155.56	95	1688.89	125	2222.22	155	2755.56
6	106.67	36	640.00	66	1173.33	96	1706.67	126	2240.00	156	2773.33
7	124.44	37	657.78	67	1191.11	97	1724.44	127	2257.78	157	2791.11
8	142.22	38	675.56	68	1208.89	98	1742.22	128	2275.56	158	2808.89
9	160.00	39	693.33	69	1226.67	99	1760.00	129	2293.33	159	2826.67
10	177.78	40	711.11	70	1244.44	100	1777.78	130	2311.11	160	2844.44
11	195.56	41	728.89	71	1262.22	101	1795.56	131	2328.89	161	2862.22
12	213.33	42	746.67	72	1280.00	102	1813.33	132	2346.67	162	2880.00
13	231.11	43	764.44	73	1297.78	103	1831.11	133	2364.44	163	2897.78
14	248.89	44	782.22	74	1315.56	104	1848.89	134	2382.22	164	2915.56
15	266.67	45	800.00	75	1333.33	105	1866.67	135	2400.00	165	2933.33
16	284.44	46	817.78	76	1351.11	106	1884.44	136	2417.78	166	2951.11
17	302.22	47	835.56	77	1368.89	107	1902.22	137	2435.56	167	2968.89
18	320.00	48	853.33	78	1386.67	108	1920.00	138	2453.33	168	2986.67
19	337.78	49	871.11	79	1404.44	109	1937.78	139	2471.11	169	3004.44
20	355.56	50	888.89	80	1422.22	110	1955.56	140	2488.89	170	3022.22
21	373.33	51	906.67	81	1440.00	111	1973.33	141	2506.67	171	3040.00
22	391.11	52	924.44	82	1457.78	112	1991.11	142	2524.44	172	3057.78
23	408.89	53	942.22	83	1475.56	113	2008.89	143	2542.22	173	3075.56
24	426.67	54	960.00	84	1493.33	114	2026.67	144	2560.00	174	3093.33
25	444.44	55	977.78	85	1511.11	115	2044.44	145	2577.78	175	3111.11
26	462.22	56	995.56	86	1528.89	116	2062.22	146	2595.56	176	3128.89
27	480.00	57	1013.33	87	1546.67	117	2080.00	147	2613.33	177	3146.67
28	497.78	58	1031.11	88	1564.44	118	2097.78	148	2631.11	178	3164.44
29	515.56	59	1048.89	89	1582.22	119	2115.56	149	2648.89	179	3182.22
30	533.33	60	1066.67	90	1600.00	120	2133.33	150	2666.67	180	3200.00

Minutes						Seconds					
Min	Mils	Min	Mils	Min	Mils	Sec	Mils	Sec	Mils	Sec	Mils
1	0.30	21	6.22	41	12.15	1	0.00	21	0.10	41	0.20
2	0.59	22	6.52	42	12.44	2	0.01	22	0.11	42	0.21
3	0.89	23	6.81	43	12.74	3	0.01	23	0.11	43	0.21
4	1.19	24	7.11	44	13.04	4	0.02	24	0.12	44	0.22
5	1.48	25	7.41	45	13.33	5	0.02	25	0.12	45	0.22
6	1.78	26	7.70	46	13.63	6	0.03	26	0.13	46	0.23
7	2.07	27	8.00	47	13.93	7	0.03	27	0.13	47	0.23
8	2.37	28	8.30	48	14.22	8	0.04	28	0.14	48	0.24
9	2.67	29	8.59	49	14.52	9	0.04	29	0.14	49	0.24
10	2.96	30	8.89	50	14.81	10	0.05	30	0.15	50	0.25
11	3.26	31	9.19	51	15.11	11	0.05	31	0.15	51	0.25
12	3.56	32	9.48	52	15.41	12	0.06	32	0.16	52	0.26
13	3.85	33	9.78	53	15.70	13	0.06	33	0.16	53	0.26
14	4.15	34	10.07	54	16.00	14	0.07	34	0.17	54	0.27
15	4.44	35	10.37	55	16.30	15	0.07	35	0.17	55	0.27
16	4.74	36	10.67	56	16.59	16	0.08	36	0.18	56	0.28
17	5.04	37	10.96	57	16.89	17	0.08	37	0.18	57	0.28
18	5.33	38	11.26	58	17.19	18	0.09	38	0.19	58	0.29
19	5.63	39	11.56	59	17.48	19	0.09	39	0.19	59	0.29
20	5.93	40	11.85	60	17.78	20	0.10	40	0.20	60	0.30

Table 6. Convergence

Northing = UTM grid northing coordinate of station in meters.
 If in Northern Hemisphere, enter table with northing.
 If in Southern Hemisphere, subtract northing of station from 10,000,000; enter table with resulting northing.
 Enter table using northing to nearest 100 meters and interpolate.
 Log XV = Log of function XV (sign always +).

Northing	Function XV	Diff.	Log XV	Diff.	Northing	Function XV	Diff.	Log XV	Diff.
0	0		0		310,000	1585.0	51.2	3.20003	1426
1,000	5.109	5.109	0.70834	70834	320,000	1636.3	51.3	3.21386	1383
2,000	10.218	5.109	1.00937	30103	330,000	1687.5	51.2	3.22724	1338
3,000	15.327	5.109	1.18546	17609	340,000	1738.7	51.2	3.24022	1298
4,000	20.430	5.109	1.31040	12494	350,000	1789.9	51.2	3.25283	1261
5,000	25.545	5.109	1.40731	9691	360,000	1841.2	51.3	3.26510	1227
6,000	30.654	5.109	1.48649	7918	370,000	1892.4	51.2	3.27701	1191
7,000	35.763	5.109	1.55343	6694	380,000	1943.7	51.3	3.28863	1162
8,000	40.872	5.109	1.61143	5800	390,000	1995.0	51.3	3.29994	1131
9,000	45.981	5.109	1.66258	5115	400,000	2046.3	51.3	3.31097	1103
10,000	51.090	5.109	1.70834	4576	410,000	2097.6	51.3	3.32172	1075
20,000	102.18	51.09	2.00937	30103	420,000	2148.9	51.3	3.33222	1050
30,000	153.27	51.09	2.18546	17609	430,000	2200.2	51.3	3.34246	1024
40,000	204.36	51.09	2.31040	12494	440,000	2251.5	51.3	3.35247	1001
50,000	255.46	51.10	2.40732	9692	450,000	2302.9	51.4	3.36228	981
60,000	306.55	51.09	2.48650	7918	460,000	2354.2	51.3	3.37184	956
70,000	357.65	51.10	2.55346	6696	470,000	2405.6	51.4	3.38122	938
80,000	408.74	51.09	2.61145	5799	480,000	2456.9	51.3	3.39039	917
90,000	459.84	51.10	2.66261	5116	490,000	2508.3	51.4	3.39938	899
100,000	510.94	51.10	2.70837	4576	500,000	2559.7	51.4	3.40819	881
110,000	562.05	51.11	2.74978	4141	510,000	2611.1	51.4	3.41682	863
120,000	613.15	51.10	2.78757	3779	520,000	2662.6	51.5	3.42531	849
130,000	664.26	51.11	2.82234	3477	530,000	2714.0	51.4	3.43361	830
140,000	715.38	51.12	2.85454	3220	540,000	2765.4	51.4	3.44176	815
150,000	766.49	51.11	2.88451	2997	550,000	2816.9	51.5	3.44977	801
160,000	817.61	51.12	2.91255	2804	560,000	2868.4	51.5	3.45764	787
170,000	868.74	51.13	2.93889	2634	570,000	2919.9	51.5	3.46537	773
180,000	919.87	51.13	2.96373	2484	580,000	2971.4	51.5	3.47296	759
190,000	971.00	51.13	2.98722	2349	590,000	3022.9	51.5	3.48042	746
200,000	1022.1	51.1	3.00949	2227	600,000	3074.4	51.5	3.48776	734
210,000	1073.3	51.2	3.03072	2123	610,000	3126.0	51.6	3.49499	723
220,000	1124.4	51.1	3.05092	2020	620,000	3177.5	51.5	3.50209	710
230,000	1175.6	51.2	3.07026	1934	630,000	3229.1	51.6	3.50908	699
240,000	1226.7	51.1	3.08874	1848	640,000	3280.7	51.6	3.51597	689
250,000	1277.9	51.2	3.10650	1776	650,000	3332.3	51.6	3.52274	677
260,000	1329.1	51.2	3.12356	1706	660,000	3384.0	51.7	3.52943	669
270,000	1380.3	51.2	3.13997	1641	670,000	3435.6	51.6	3.53600	657
280,000	1431.4	51.1	3.15576	1579	680,000	3487.3	51.7	3.54249	649
290,000	1482.6	51.2	3.17102	1526	690,000	3539.0	51.7	3.54888	639
300,000	1533.8	51.2	3.18577	1475	700,000	3590.7	51.7	3.55518	630

Table 6. Convergence—Continued

Northung	Function XV	Diff.	Log XV	Diff.	Northung	Function XV	Diff.	Log XV	Diff
710,000	3642.4	51.7	3.56139	621	1,060,000	5465.7	52.5	3.73765	420
720,000	3694.1	51.7	3.56751	612	1,070,000	5518.2	52.5	3.74180	415
730,000	3745.9	51.8	3.57356	605	1,080,000	5570.8	52.6	3.74592	412
740,000	3797.6	51.7	3.57951	595	1,090,000	5623.4	52.6	3.75000	408
750,000	3849.4	51.8	3.58539	588	1,100,000	5676.0	52.6	3.75404	404
760,000	3901.2	51.8	3.59120	581	1,110,000	5728.6	52.6	3.75805	401
770,000	3953.1	51.9	3.59694	574	1,120,000	5781.3	52.7	3.76203	398
780,000	4004.9	51.8	3.60259	565	1,130,000	5834.0	52.7	3.76597	394
790,000	4056.8	51.9	3.60818	559	1,140,000	5886.7	52.7	3.76987	390
800,000	4108.7	51.9	3.61370	552	1,150,000	5939.5	52.8	3.77375	388
810,000	4160.6	51.9	3.61916	546	1,160,000	5992.3	52.8	3.77759	384
820,000	4212.5	51.9	3.62454	538	1,170,000	6045.1	52.8	3.78140	381
830,000	4264.4	52.0	3.62986	532	1,180,000	6098.0	52.9	3.78519	379
840,000	4316.4	52.0	3.63512	526	1,190,000	6150.9	52.9	3.78894	375
850,000	4368.4	52.0	3.64032	520	1,200,000	6203.8	52.9	3.79266	372
860,000	4420.4	52.0	3.64546	514	1,210,000	6256.7	52.9	3.79635	369
870,000	4472.5	52.1	3.65055	509	1,220,000	6309.7	53.0	3.80001	366
880,000	4524.5	52.0	3.65557	502	1,230,000	6362.7	53.0	3.80364	363
890,000	4576.6	52.1	3.66054	497	1,240,000	6415.8	53.1	3.80725	361
900,000	4628.7	52.1	3.66546	492	1,250,000	6468.8	53.0	3.81082	357
910,000	4680.8	52.1	3.67032	486	1,260,000	6521.9	53.1	3.81437	355
920,000	4733.0	52.2	3.67514	482	1,270,000	6575.1	53.2	3.81790	353
930,000	4785.2	52.2	3.67990	476	1,280,000	6628.3	53.2	3.82140	350
940,000	4837.3	52.1	3.68460	470	1,290,000	6681.5	53.2	3.82487	347
950,000	4889.6	52.3	3.68927	467	1,300,000	6734.7	53.2	3.82832	345
960,000	4941.8	52.2	3.69389	462	1,310,000	6788.0	53.3	3.83174	342
970,000	4994.1	52.3	3.69846	457	1,320,000	6841.3	53.3	3.83514	340
980,000	5046.4	52.3	3.70298	452	1,330,000	6894.7	53.4	3.83852	338
990,000	5098.7	52.3	3.70746	448	1,340,000	6948.0	53.3	3.84186	334
1,000,000	5151.1	52.4	3.71190	444	1,350,000	7001.5	53.5	3.84519	333
1,010,000	5203.4	52.3	3.71629	439	1,360,000	7054.9	53.4	3.84849	330
1,020,000	5255.8	52.4	3.72064	435	1,370,000	7108.4	53.5	3.85177	328
1,030,000	5308.2	52.4	3.72495	431	1,380,000	7161.9	53.5	3.85503	326
1,040,000	5360.7	52.5	3.72922	427	1,390,000	7215.5	53.6	3.85827	324
1,050,000	5413.2	52.5	3.73345	423	1,400,000	7269.1	53.6	3.86148	321

Table 6. Convergence—Continued

Northing	Function XV	Diff.	Log XV	Diff.	Northing	Function XV	Diff.	Log XV	Diff.
1,410,000	7322.7	53.6	3.86467	319	1,760,000	9226.0	55.2	3.96501	260
1,420,000	7376.4	53.7	3.86784	317	1,770,000	9281.2	55.2	3.96760	259
1,430,000	7430.1	53.7	3.87099	315	1,780,000	9336.4	55.2	3.97018	258
1,440,000	7483.9	53.8	3.87413	314	1,790,000	9391.7	55.3	3.97274	256
1,450,000	7537.7	53.8	3.87724	311	1,800,000	9447.0	55.3	3.97529	255
1,460,000	7591.5	53.8	3.88033	309	1,810,000	9502.4	55.4	3.97783	254
1,470,000	7645.4	53.9	3.88340	307	1,820,000	9557.9	55.5	4.98036	253
1,480,000	7699.3	53.9	3.88645	305	1,830,000	9613.4	55.5	3.98288	252
1,490,000	7753.2	53.9	3.88948	303	1,840,000	9668.9	55.5	3.98538	250
1,500,000	7807.2	54.0	3.89250	302	1,850,000	9724.5	55.6	3.98787	249
1,510,000	7861.2	54.0	3.89549	299	1,860,000	9780.1	55.6	3.99034	247
1,520,000	7915.3	54.1	3.89847	298	1,870,000	9835.8	55.7	3.99281	247
1,530,000	7969.4	54.1	3.90143	296	1,880,000	9891.6	55.8	3.99527	246
1,540,000	8023.6	54.2	3.90437	294	1,890,000	9947.4	55.8	3.99771	244
1,550,000	8077.8	54.2	3.90729	292	1,900,000	10008	55.6	4.00013	242
1,560,000	8132.0	54.2	3.91020	291	1,910,000	10059	56	4.00255	242
1,570,000	8186.3	54.3	3.91309	289	1,920,000	10115	56	4.00497	242
1,580,000	8240.6	54.3	3.91596	287	1,930,000	10171	56	4.00736	239
1,590,000	8294.9	54.3	3.91881	285	1,940,000	10227	56	4.00975	239
1,600,000	8349.3	54.4	3.92165	284	1,950,000	10283	56	4.01212	237
1,610,000	8403.8	54.5	3.92448	283	1,960,000	10339	56	4.01448	236
1,620,000	8458.3	54.5	3.92728	280	1,970,000	10396	57	4.01687	239
1,630,000	8512.8	54.5	3.93007	279	1,980,000	10452	56	4.01920	233
1,640,000	8567.4	54.6	3.93285	278	1,990,000	10508	56	4.02152	232
1,650,000	8622.0	54.6	3.93581	276	2,000,000	10565	57	4.02387	235
1,660,000	8676.7	54.7	3.93835	274	2,010,000	10621	56	4.02617	230
1,670,000	8731.4	54.7	3.94108	273	2,020,000	10678	57	4.02849	232
1,680,000	8786.2	54.8	3.94380	272	2,030,000	10734	56	4.03076	227
1,690,000	8841.0	54.8	3.94650	270	2,040,000	10791	57	4.03306	230
1,700,000	8895.9	54.9	3.94919	269	2,050,000	10848	57	4.03535	229
1,710,000	8950.8	54.9	3.95186	267	2,060,000	10904	56	4.03759	224
1,720,000	9005.7	54.9	3.95452	266	2,070,000	10961	57	4.03985	226
1,730,000	9060.7	55.0	3.95716	264	2,080,000	11018	57	4.04210	225
1,740,000	9115.7	55.0	3.95979	263	2,090,000	11075	57	4.04434	224
1,750,000	9170.8	55.1	3.96241	262	2,100,000	11132	57	4.04657	223

Table 6. Convergence—Continued

Northing	Function XV	Diff.	Log XV	Diff.	Northing	Function XV	Diff.	Log XV	Diff.
2,110,000	11189	57	4.04879	222	2,460,000	13228	60	4.12149	197
2,120,000	11246	57	4.05100	221	2,470,000	13287	59	4.12343	194
2,130,000	11303	57	4.05319	219	2,480,000	13347	60	4.12538	195
2,140,000	11361	58	4.05542	223	2,490,000	13406	59	4.12730	192
2,150,000	11418	57	4.05759	217	2,500,000	13466	60	4.12924	194
2,160,000	11475	57	4.05975	216	2,510,000	13526	60	4.13117	193
2,170,000	11533	58	4.06194	219	2,520,000	13586	60	4.13309	192
2,180,000	11590	57	4.06408	214	2,530,000	13646	60	4.13501	190
2,190,000	11648	58	4.06625	217	2,540,000	13706	60	4.13691	190
2,200,000	11705	57	4.06837	212	2,550,000	13766	60	4.13881	189
2,210,000	11763	58	4.07052	215	2,560,000	13826	60	4.14070	188
2,220,000	11821	58	4.07265	213	2,570,000	13886	60	4.14258	190
2,230,000	11879	58	4.07478	213	2,580,000	13947	61	4.14448	187
2,240,000	11937	58	4.07690	212	2,590,000	14007	60	4.14635	188
2,250,000	11995	58	4.07900	210	2,600,000	14068	61	4.14823	185
2,260,000	12053	58	4.08110	210	2,610,000	14128	60	4.15008	187
2,270,000	12111	58	4.08318	208	2,620,000	14189	61	4.15195	186
2,280,000	12169	58	4.08525	207	2,630,000	14250	61	4.15381	186
2,290,000	12227	58	4.08732	207	2,640,000	14311	61	4.15567	185
2,300,000	12285	58	4.08938	206	2,650,000	14372	61	4.15752	184
2,310,000	12344	59	4.09146	208	2,660,000	14433	61	4.15936	183
2,320,000	12402	58	4.09349	203	2,670,000	14494	61	4.16119	182
2,330,000	12461	59	4.09555	206	2,680,000	14555	61	4.16301	182
2,340,000	12519	58	4.09757	202	2,690,000	14616	61	4.16483	184
2,350,000	12578	59	4.09961	204	2,700,000	14678	62	4.16667	180
2,360,000	12636	58	4.10161	200	2,710,000	14739	61	4.16847	182
2,370,000	12695	59	4.10363	202	2,720,000	14801	62	4.17029	179
2,380,000	12754	59	4.10565	202	2,730,000	14862	61	4.17208	179
2,390,000	12813	59	4.10765	200	2,740,000	14924	62	4.17389	181
2,400,000	12872	59	4.10965	200	2,750,000	14986	62	4.17569	180
2,410,000	12931	59	4.11163	198	2,760,000	15048	62	4.17748	179
2,420,000	12990	59	4.11361	198	2,770,000	15110	62	4.17926	178
2,430,000	13049	59	4.11558	197	2,780,000	15172	62	4.18104	178
2,440,000	13109	60	4.11757	199	2,790,000	15234	62	4.18281	177
2,450,000	13168	59	4.11952	195	2,800,000	15296	62	4.18458	177

Table 6. Convergence—Continued

Northing	Function XV	Diff	Log XV	Diff	Northing	Function XV	Diff	Log XV	Diff.
2,810,000	15359	63	4.18636	178	3,160,000	17603	66	4.24559	163
2,820,000	15421	62	4.18811	175	3,170,000	17669	66	4.24721	162
2,830,000	15484	63	4.18988	177	3,180,000	17735	66	4.24883	162
2,840,000	15546	62	4.19162	174	3,190,000	17801	66	4.25044	161
2,850,000	15609	63	4.19338	176	3,200,000	17868	67	4.25208	164
2,860,000	15672	63	4.19512	174	3,210,000	17934	66	4.25368	160
2,870,000	15735	63	4.19687	175	3,220,000	18001	67	4.25530	162
2,880,000	15798	63	4.19860	173	3,230,000	18067	66	4.25689	159
2,890,000	15861	63	4.20033	173	3,240,000	18134	67	4.25849	160
2,900,000	15924	63	4.20205	172	3,250,000	18201	67	4.26010	161
2,910,000	15987	63	4.20377	172	3,260,000	18268	67	4.26169	159
2,920,000	16051	64	4.20550	173	3,270,000	18335	67	4.26328	159
2,930,000	16114	63	4.20720	170	3,280,000	18403	68	4.26489	161
2,940,000	16178	64	4.20892	172	3,290,000	18470	67	4.26647	158
2,950,000	16242	64	4.21064	172	3,300,000	18538	68	4.26806	159
2,960,000	16305	63	4.21232	168	3,310,000	18605	67	4.26963	157
2,970,000	16369	64	4.21402	170	3,320,000	18673	68	4.27121	158
2,980,000	16433	64	4.21572	170	3,330,000	18741	68	4.27279	158
2,990,000	16497	64	4.21740	168	3,340,000	18809	68	4.27437	158
3,000,000	16561	64	4.21909	160	3,350,000	18877	68	4.27593	156
3,010,000	16626	65	4.22079	170	3,360,000	18945	68	4.27749	156
3,020,000	16690	64	4.22246	167	3,370,000	19014	69	4.27907	158
3,030,000	16755	65	4.22414	168	3,380,000	19082	68	4.28062	155
3,040,000	16819	64	4.22580	166	3,390,000	19151	69	4.28219	157
3,050,000	16884	65	4.22748	168	3,400,000	19219	68	4.28373	154
3,060,000	16949	65	4.22914	166	3,410,000	19288	69	4.28529	156
3,070,000	17014	65	4.23081	167	3,420,000	19357	69	4.28684	155
3,080,000	17079	65	4.23246	165	3,430,000	19427	70	4.28841	157
3,090,000	17144	65	4.23411	165	3,440,000	19496	69	4.28995	154
3,100,000	17209	65	4.23576	165	3,450,000	19565	69	4.29148	153
3,110,000	17274	65	4.23739	163	3,460,000	19635	70	4.29303	155
3,120,000	17340	66	4.23905	166	3,470,000	19704	69	4.29455	152
3,130,000	17406	66	4.24070	165	3,480,000	19774	70	4.29609	154
3,140,000	17471	65	4.24232	162	3,490,000	19844	70	4.29763	154
3,150,000	17537	66	4.24396	164	3,500,000	19914	70	4.29916	153

Table 6. Convergence—Continued

Northing	Function XV	Diff.	Log XV	Diff.	Northing	Function XV	Diff.	Log XV	Diff.
3,510,000	19984	70	4.30068	152	3,860,000	22532	75	4.35280	145
3,520,000	20055	71	4.30222	154	3,870,000	22608	76	4.35426	146
3,350,000	20125	70	4.30374	152	3,880,000	22683	75	4.35570	144
3,540,000	20196	71	4.30527	153	3,890,000	22759	76	4.35715	145
3,550,000	20267	71	4.30679	152	3,900,000	22835	76	4.35860	145
3,560,000	20337	70	4.30829	150	3,910,000	22911	76	4.36004	144
3,570,000	20408	71	4.30980	151	3,920,000	22988	77	4.36150	146
3,580,000	20480	72	4.31133	153	3,930,000	23064	76	4.36293	143
3,590,000	20551	71	4.31283	150	3,940,000	23141	77	4.36438	145
3,600,000	20622	71	4.31433	150	3,950,000	23218	77	4.36582	144
3,610,000	20694	72	4.31584	151	3,960,000	23295	77	4.36726	144
3,620,000	20766	72	4.31735	151	3,970,000	23372	77	4.36870	144
3,630,000	20837	71	4.31884	149	3,980,000	23450	78	4.37014	144
3,640,000	20909	72	4.32033	149	3,990,000	23527	77	4.37157	143
3,650,000	20982	73	4.32185	152	4,000,000	23605	78	4.37300	143
3,660,000	21054	72	4.32333	148	4,010,000	23683	78	4.37444	144
3,670,000	21126	72	4.32482	149	4,020,000	23761	78	4.37586	142
3,680,000	21199	73	4.32632	150	4,030,000	23840	79	4.37731	145
3,690,000	21272	73	4.32781	149	4,040,000	23918	78	4.37731	141
3,700,000	21345	73	4.32930	149	4,050,000	23997	79	4.37872	144
3,710,000	21418	73	4.33078	148	4,060,000	24076	79	4.38016	142
3,720,000	21491	73	4.33226	148	4,070,000	24155	79	4.38158	143
3,730,000	21564	73	4.33373	147	4,080,000	24234	79	4.38301	142
3,740,000	21638	74	4.33522	149	4,090,000	24313	79	4.38443	141
3,750,000	21711	73	4.33668	146	4,100,000	24393	80	4.38584	141
3,760,000	21785	74	4.33816	148	4,110,000	24473	80	4.38727	143
3,770,000	21859	74	4.33963	147	4,120,000	24553	80	4.38869	142
3,780,000	21933	74	4.34110	147	4,130,000	24633	80	4.39010	141
3,790,000	22008	75	4.34258	148	4,140,000	24713	80	4.39152	142
3,800,000	22082	74	4.34404	146	4,150,000	24794	81	4.39293	141
3,810,000	22157	75	4.34551	147	4,160,000	24874	81	4.39435	142
3,820,000	22231	74	4.34696	145	4,170,000	24955	80	4.39575	140
3,830,000	22306	75	4.34842	146	4,180,000	25036	81	4.39716	141
3,840,000	22381	75	4.34988	146	4,190,000	25118	81	4.39856	140
3,850,000	22457	76	4.35135	147	4,200,000	25199	82	4.39999	143
							81	4.40138	139

Table 6. Convergence—Continued

Northing	Function XV	Diff.	Log XV	Diff.	Northing	Function XV	Diff.	Log XV	Diff.
4,210,000	25281	82	4.40279	141	4,560,000	28275	89	4.45140	137
4,220,000	25363	82	4.40420	141	4,570,000	28365	90	4.45278	138
4,230,000	25445	82	4.40560	140	4,580,000	28455	90	4.45416	138
4,240,000	25527	82	4.40700	140	4,590,000	28545	90	4.45553	137
4,250,000	25610	83	4.40841	141	4,600,000	28635	90	4.45690	137
4,260,000	25692	82	4.40980	139	4,610,000	28726	91	4.45828	138
4,270,000	25775	83	4.41120	140	4,620,000	28817	91	4.45965	137
4,280,000	25859	84	4.41261	141	4,630,000	28908	91	4.46102	137
4,290,000	25942	83	4.41400	139	4,640,000	29000	92	4.46240	138
4,300,000	26025	83	4.41539	139	4,650,000	29091	91	4.46376	136
4,310,000	26109	84	4.41679	140	4,660,000	29183	92	4.46513	137
4,320,000	26193	84	4.41819	140	4,670,000	29276	93	4.46651	138
4,330,000	26277	84	4.41958	139	4,680,000	29368	92	4.46787	136
4,340,000	26362	85	4.42098	140	4,690,000	29461	93	4.46925	138
4,350,000	26446	84	4.42236	138	4,700,000	29554	93	4.47062	137
4,360,000	26531	85	4.42375	139	4,710,000	29647	93	4.47198	136
4,370,000	26616	85	4.42514	139	4,720,000	29740	93	4.47334	136
4,380,000	26702	86	4.42654	140	4,730,000	29834	94	4.47471	137
4,390,000	26787	85	4.42792	138	4,740,000	29928	94	4.47608	137
4,400,000	26873	86	4.42932	140	4,750,000	30023	95	4.47745	137
4,410,000	26959	86	4.43070	138	4,760,000	30117	94	4.47881	136
4,420,000	27045	86	4.43209	139	4,770,000	30212	95	4.48018	137
4,430,000	27131	86	4.43347	138	4,780,000	30307	95	4.48154	136
4,440,000	27218	87	4.43486	139	4,790,000	30403	96	4.48292	138
4,450,000	27305	87	4.43624	138	4,800,000	30498	95	4.48427	135
4,460,000	27392	87	4.43762	138	4,810,000	30594	96	4.48564	137
4,470,000	27479	87	4.43900	137	4,820,000	30691	97	4.48701	137
4,480,000	27567	88	4.44039	137	4,830,000	30787	96	4.48837	136
4,490,000	27654	87	4.44176	138	4,840,000	30884	97	4.48973	136
4,500,000	27742	88	4.44314	138	4,850,000	30981	97	4.49110	137
4,510,000	27831	89	4.44453	139	4,860,000	31079	98	4.49247	137
4,520,000	27919	88	4.44590	137	4,870,000	31177	98	4.49383	136
4,530,000	28008	89	4.44728	138	4,880,000	31275	98	4.49520	137
4,540,000	28097	89	4.44866	137	4,890,000	31373	98	4.49656	136
4,550,000	28186	89	4.45003	137	4,900,000	31472	99	4.49792	136

Table 6. Convergence—Continued

Northing	Function XV	Diff	Log XV	Diff.	Northing	Function XV	Diff.	Log XV	Diff
4,910,000	31570	98	4.49927	135	5,260,000	35238	111	4.54701	137
4,920,000	31670	100	4.50065	138	5,270,000	35349	111	4.54838	137
4,930,000	31769	99	4.50200	135	5,280,000	35460	111	4.54974	136
4,940,000	31869	100	4.50337	137	5,290,000	35572	112	4.55111	137
4,950,000	31969	100	4.50473	136	5,300,000	35684	112	4.55247	136
4,960,000	32070	101	4.50610	137	5,310,000	35797	113	4.55385	138
4,970,000	32170	100	4.50745	135	5,320,000	35910	113	4.55522	137
4,980,000	32272	102	4.50883	138	5,330,000	36023	113	4.55658	136
4,990,000	32373	101	4.51018	135	5,340,000	36137	114	4.55795	137
5,000,000	32475	102	4.51155	137	5,350,000	36252	115	4.55933	138
5,010,000	32577	102	4.51291	136	5,360,000	36366	114	4.56070	137
5,020,000	32679	102	4.51427	136	5,370,000	36481	115	4.56207	137
5,030,000	32782	103	4.51564	137	5,380,000	36597	116	4.56345	138
5,040,000	32885	103	4.51700	136	5,390,000	36712	115	4.56481	136
5,050,000	32988	103	4.51836	136	5,400,000	36829	117	4.56619	138
5,060,000	33092	104	4.51972	136	5,410,000	36945	116	4.56756	137
5,070,000	33196	104	4.52109	137	5,420,000	37062	117	4.56893	137
5,080,000	33300	104	4.52244	135	5,430,000	37180	118	4.57031	138
5,090,000	33405	105	4.52381	137	5,440,000	37298	118	4.57169	138
5,100,000	33510	105	4.52517	136	5,450,000	37416	118	4.57306	137
5,110,000	33615	105	4.52653	136	5,460,000	37535	119	4.57444	138
5,120,000	33721	106	4.52790	137	5,470,000	37654	119	4.57581	137
5,130,000	33827	106	4.52926	136	5,480,000	37774	120	4.57719	138
5,140,000	33933	106	4.53062	136	5,490,000	37894	120	4.57857	138
5,150,000	34040	107	4.53199	137	5,500,000	38015	121	4.57996	139
5,160,000	34147	107	4.53335	136	5,510,000	38136	121	4.58134	138
5,170,000	34251	107	4.53471	136	5,520,000	38257	121	4.58271	137
5,180,000	34362	108	4.53608	137	5,530,000	38379	122	4.58409	138
5,190,000	34470	108	4.53744	136	5,540,000	38501	122	4.58547	138
5,200,000	34579	109	4.53881	137	5,550,000	38624	123	4.58686	139
5,210,000	34688	109	4.54018	137	5,560,000	38747	123	4.58824	138
5,220,000	34797	109	4.54154	136	5,570,000	38871	124	4.58963	139
5,230,000	34907	110	4.54291	137	5,580,000	38995	124	4.59101	138
5,240,000	35017	110	4.54428	137	5,590,000	39120	125	4.59240	139
5,250,000	35127	110	4.54564	136	5,600,000	39245	125	4.59378	138

Table 6. Convergence—Continued

Northing	Function XV	Diff.	Log XV	Diff.	Northing	Function XV	Diff.	Log XV	Diff.
5,610,000	39370	125	4.59517	139	5,960,000	44094	144	4.64438	142
5,620,000	39496	126	4.59655	138	5,970,000	44239	145	4.64581	143
5,630,000	39623	127	4.59795	140	5,980,000	44385	146	4.64724	143
5,640,000	39750	127	4.59934	139	5,990,000	44532	147	4.64867	143
5,650,000	39878	128	4.60073	139	6,000,000	44679	147	4.65010	143
5,660,000	40006	128	4.60213	140	6,010,000	44826	147	4.65153	143
5,670,000	40134	128	4.60351	138	6,020,000	44975	149	4.65297	144
5,680,000	40263	129	4.60491	140	6,030,000	45124	149	4.65441	144
5,690,000	40393	130	4.60631	140	6,040,000	45274	150	4.65585	144
5,700,000	40523	130	4.60770	139	6,050,000	45424	150	4.65729	144
5,710,000	40653	130	4.60909	139	6,060,000	45575	151	4.65873	144
5,720,000	40784	131	4.61049	140	6,070,000	45727	152	4.66017	144
5,730,000	40916	132	4.61189	140	6,080,000	45879	152	4.66161	145
5,740,000	41048	132	4.61329	140	6,090,000	46032	153	4.66306	145
5,750,000	41181	133	4.61470	141	6,100,000	46186	154	4.66451	145
5,760,000	41314	133	4.61610	140	6,110,000	46340	154	4.66596	145
5,770,000	41447	133	4.61749	139	6,120,000	46495	155	4.66741	145
5,780,000	41582	135	4.61891	142	6,130,000	46651	156	4.66886	145
5,790,000	41716	134	4.62030	139	6,140,000	46807	156	4.67031	145
5,800,000	41852	136	4.62172	142	6,150,000	46965	158	4.67177	146
5,810,000	41988	136	4.62313	141	6,160,000	47123	158	4.67323	146
5,820,000	42124	136	4.62453	140	6,170,000	47281	160	4.67469	146
5,830,000	42261	137	4.62594	141	6,180,000	47441	160	4.67615	147
5,840,000	42398	137	4.62735	141	6,190,000	47601	160	4.67762	145
5,850,000	42537	139	4.62877	142	6,200,000	47761	160	4.67907	145
5,860,000	42675	138	4.63017	140	6,210,000	47923	162	4.68054	147
5,870,000	42814	139	4.63159	142	6,220,000	48078	155	4.68195	141
5,880,000	42954	140	4.63300	141	6,230,000	48241	163	4.68342	147
5,890,000	43095	141	4.63443	143	6,240,000	48405	164	4.68489	147
5,900,000	43236	141	4.63585	142	6,250,000	48570	165	4.68637	148
5,910,000	43377	141	4.63726	141	6,260,000	48735	165	4.68784	147
5,920,000	43519	142	4.63868	142	6,270,000	48901	166	4.68932	148
5,930,000	43662	143	4.64010	142	6,280,000	49068	167	4.69080	148
5,940,000	43805	143	4.64152	142	6,290,000	49236	168	4.69228	148
5,950,000	43950	145	4.64296	144	6,300,000	49404	168	4.69376	148

Table 6. Convergence—Continued

Northing	Function XV	Diff	Log XV	Diff.	Northing	Function XV	Diff.	Log XV	Diff.
6,310,000	49574	170	4.69525	149	6,660,000	56067	203	4.74871	158
6,320,000	49744	170	4.69674	149	6,670,000	56270	203	4.75028	157
6,330,000	49915	171	4.69823	149	6,680,000	56475	205	4.75186	158
6,340,000	50087	172	4.69973	150	6,690,000	56681	206	4.75344	158
6,350,000	50259	172	4.70121	148	6,700,000	56888	207	4.75502	158
6,360,000	50433	174	4.70271	150	6,710,000	57096	208	4.75661	159
6,370,000	50607	174	4.70421	150	6,720,000	57305	209	4.75819	158
6,380,000	50782	175	4.70571	150	6,730,000	57515	210	4.75978	159
6,390,000	50958	176	4.70721	150	6,740,000	57727	212	4.76138	160
6,400,000	51135	177	4.70872	151	6,750,000	57940	213	4.76298	160
6,410,000	51313	178	4.71023	151	6,760,000	58153	213	4.76457	159
6,420,000	51492	179	4.71174	151	6,770,000	58369	216	4.76618	161
6,430,000	51671	179	4.71325	151	6,780,000	58585	216	4.76779	161
6,440,000	51852	181	4.71477	152	6,790,000	58803	218	4.76940	161
6,450,000	52033	181	4.71628	151	6,800,000	59021	218	4.77101	161
6,460,000	52215	182	4.71780	152	6,810,000	59241	220	4.77262	161
6,470,000	52399	184	4.71932	152	6,820,000	59463	222	4.77425	163
6,480,000	52583	184	4.72085	153	6,830,000	59685	222	4.77587	162
6,490,000	52768	185	4.72237	152	6,840,000	59909	224	4.77749	162
6,500,000	52954	186	4.72390	153	6,850,000	60134	225	4.77912	163
6,510,000	53141	187	4.72543	153	6,860,000	60361	227	4.78076	164
6,520,000	53329	188	4.72696	153	6,870,000	60589	228	4.78239	163
6,530,000	53518	189	4.72850	154	6,880,000	60818	229	4.78403	164
6,540,000	53708	190	4.73004	154	6,890,000	61049	231	4.78568	165
6,550,000	53899	191	4.73158	154	6,900,000	61281	232	4.78733	165
6,560,000	54091	192	4.73313	155	6,910,000	61514	233	4.78897	164
6,570,000	54284	193	4.73467	154	6,920,000	61749	235	4.79063	166
6,580,000	54478	194	4.73622	155	6,930,000	61985	236	4.79229	166
6,590,000	54673	195	4.73777	155	6,940,000	62222	237	4.79394	165
6,600,000	54869	196	4.73933	156	6,950,000	62461	239	4.79561	167
6,610,000	55066	197	4.74088	155	6,960,000	62702	241	4.79728	167
6,620,000	55264	198	4.74244	156	6,970,000	62943	241	4.79895	167
6,630,000	55463	199	4.74400	156	6,980,000	63187	244	4.80063	168
6,640,000	55663	200	4.74557	157	6,990,000	63432	245	4.80231	168
6,650,000	55864	201	4.74713	156	7,000,000	63678	246	4.80399	168

Table 6. Convergence—Continued

Northing	Function XV	Diff.	Log XV	Diff.	Northing	Function XV	Diff.	Log XV	Diff.
7,010,000	63926	248	4.80568	169	7,360,000	73698	312	4.86746	185
7,020,000	64175	249	4.80737	169	7,370,000	74013	315	4.86931	185
7,030,000	64426	251	4.80906	169	7,380,000	74330	317	4.87116	185
7,040,000	64679	253	4.81076	170	7,390,000	74650	320	4.87303	187
7,050,000	64933	254	4.81247	171	7,400,000	74972	322	4.87490	187
7,060,000	65189	256	4.81417	170	7,410,000	75296	324	4.87677	187
7,070,000	65446	257	4.81588	171	7,420,000	75623	327	4.87865	188
7,080,000	65705	259	4.81760	172	7,430,000	75952	329	4.88054	189
7,090,000	65966	261	4.81932	172	7,440,000	76283	331	4.88243	189
7,100,000	66228	262	4.82104	172	7,450,000	76617	334	4.88433	190
7,110,000	66492	264	4.82277	173	7,460,000	76953	336	4.88623	190
7,120,000	66758	266	4.82450	173	7,470,000	77292	339	4.88813	190
7,130,000	67025	267	4.82624	174	7,480,000	77633	341	4.89005	192
7,140,000	67295	270	4.82798	174	7,490,000	77977	344	4.89197	192
7,150,000	67566	271	4.82973	175	7,500,000	78324	347	4.89389	192
7,160,000	67838	272	4.83147	174	7,510,000	78673	349	4.89583	194
7,170,000	68113	275	4.83323	176	7,520,000	79025	352	4.89776	193
7,180,000	68389	276	4.83499	176	7,530,000	79380	355	4.89971	195
7,190,000	68667	278	4.83675	176	7,540,000	79737	357	4.90166	195
7,200,000	68947	280	4.83852	177	7,550,000	80097	360	4.90362	196
7,210,000	69229	282	4.84029	177	7,560,000	80460	363	4.90558	196
7,220,000	69513	284	4.84207	178	7,570,000	80826	366	4.90755	197
7,230,000	69799	286	4.84385	178	7,580,000	81195	369	4.90953	198
7,240,000	70087	288	4.84564	179	7,590,000	81566	371	4.91151	198
7,250,000	70376	289	4.84742	178	7,600,000	81941	375	4.91350	199
7,260,000	70668	292	4.84922	180	7,610,000	82318	377	4.91549	199
7,270,000	70962	294	4.85103	181	7,620,000	82699	381	4.91750	201
7,280,000	71257	295	4.85283	180	7,630,000	83082	383	4.91951	201
7,290,000	71555	298	4.85464	181	7,640,000	83469	387	4.92153	202
7,300,000	71855	300	4.85646	182	7,650,000	83859	390	4.92355	202
7,310,000	72157	302	4.85828	182	7,660,000	84252	393	4.92558	203
7,320,000	72461	304	4.86010	182	7,670,000	84648	396	4.92762	204
7,330,000	72767	306	4.86193	183	7,680,000	85048	400	4.92966	204
7,340,000	73075	308	4.86377	184	7,690,000	85450	402	4.93171	205
7,350,000	73386	311	4.86561	184	7,700,000	85857	407	4.93378	207

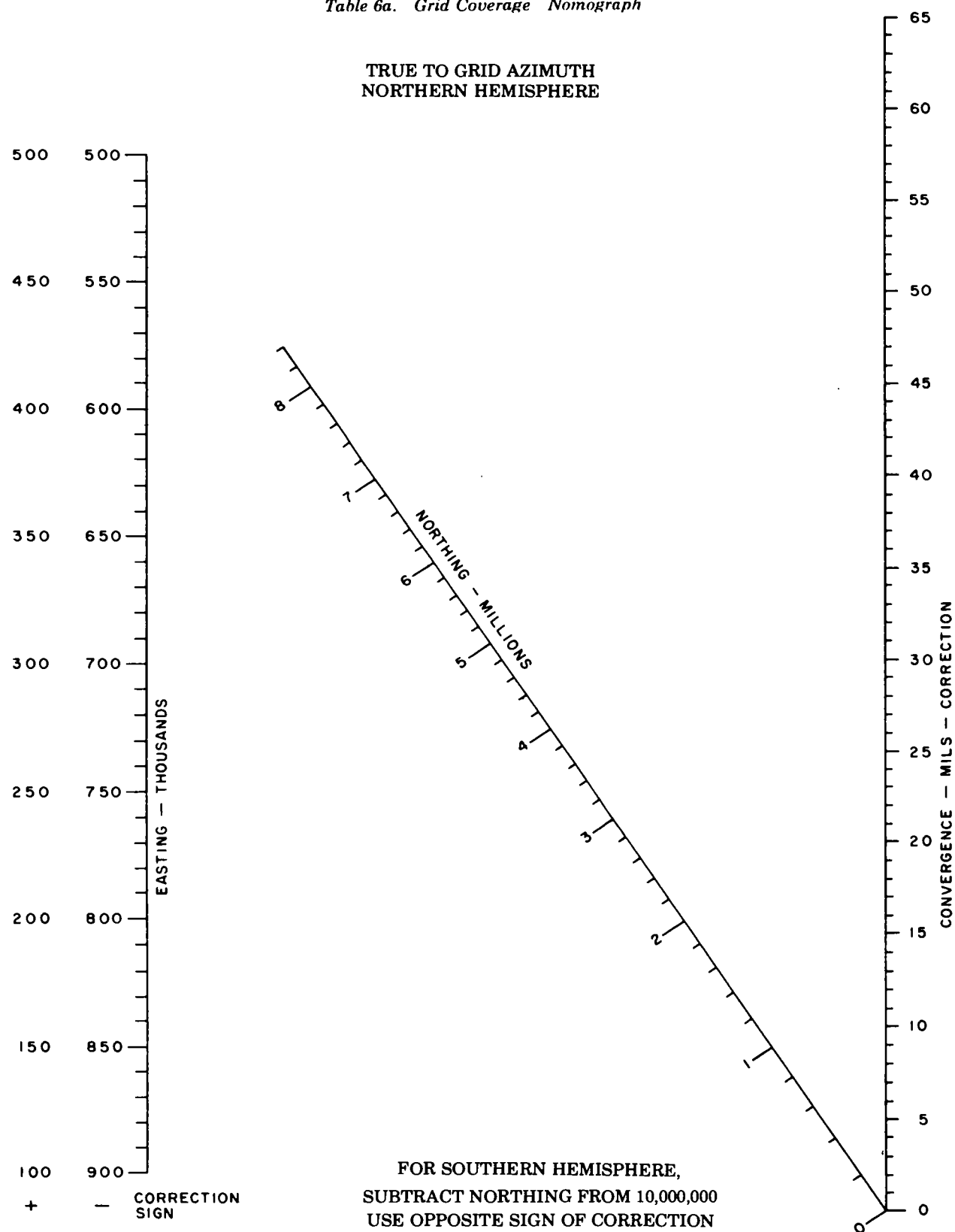
Table 6. Convergence—Continued

Northing	Function XV	Diff.	Log XV	Diff.	Northing	Function XV	Diff.	Log XV	Diff.
7,710,000	86266	409	4.93584	206	8,060,000	103149	564	5.013465	2381
7,720,000	86679	413	4.93791	207	8,070,000	103718	569	5.015854	2389
7,730,000	87096	417	4.94000	209	8,080,000	104293	575	5.018255	2401
7,740,000	87516	420	4.94209	209	8,090,000	104873	580	5.020664	2409
7,750,000	87939	423	4.94418	209	8,100,000	105460	587	5.023088	2424
7,760,000	88367	428	4.94629	211	8,110,000	106053	593	5.025523	2435
7,770,000	88797	430	4.94840	211	8,120,000	106651	598	5.027965	2442
7,780,000	89232	435	4.95052	212	8,130,000	107256	605	5.030422	2457
7,790,000	89670	438	4.95265	213	8,140,000	107868	612	5.032893	2471
7,800,000	90113	443	4.95479	214	8,150,000	108486	618	5.035374	2481
7,810,000	90559	446	4.95693	214	8,160,000	109110	624	5.037865	2491
7,820,000	91009	450	4.95908	215	8,170,000	109741	631	5.040369	2504
7,830,000	91463	454	4.96125	217	8,180,000	110379	638	5.042886	2517
7,840,000	91921	458	4.96341	216	8,190,000	111023	644	5.045413	2527
7,850,000	92383	462	4.96559	218	8,200,000	111675	652	5.047956	2543
7,860,000	92849	466	4.96778	219	8,210,000	112333	658	5.050507	2551
7,870,000	93320	471	4.96997	219	8,220,000	112999	666	5.053075	2568
7,880,000	93795	475	4.97218	221	8,230,000	113672	673	5.055654	2579
7,890,000	94274	479	4.97439	221	8,240,000	114353	681	5.058248	2594
7,900,000	94758	484	4.97662	223	8,250,000	115041	688	5.060853	2605
7,910,000	95246	488	4.97885	223	8,260,000	115737	696	5.063472	2619
7,920,000	95738	492	4.98108	223	8,270,000	116441	704	5.066106	2634
7,930,000	96235	497	4.98333	225	8,280,000	117153	712	5.068753	2647
7,940,000	96737	502	4.98559	226	8,290,000	117873	720	5.071414	2661
7,950,000	97244	507	4.98786	227	8,300,000	118601	728	5.074088	2674
7,960,000	97755	511	4.99014	228	8,310,000	119338	737	5.076779	2691
7,970,000	98271	516	4.99243	229	8,320,000	120083	745	5.079482	2703
7,980,000	98792	521	4.99472	229	8,330,000	120837	754	5.082200	2718
7,990,000	99318	526	4.99703	231	8,340,000	121600	763	5.084934	2734
8,000,000	99850	532	4.99935	232	8,350,000	122371	771	5.087679	2745
8,010,000	100386	536	5.001673	2323	8,360,000	123153	782	5.090445	2766
8,020,000	100928	542	5.004012	2339	8,370,000	123943	790	5.093222	2777
8,030,000	101475	547	5.006359	2347	8,380,000	124743	800	5.096016	2794
8,040,000	102027	552	5.008715	2356	8,390,000	125553	810	5.098827	2811
8,050,000	102585	558	5.011084	2369	8,400,000	126372	819	5.101651	2824

Table 6. Convergence—Continued

Northing	Function XV	Diff.	Log XV	Diff.	Northing	Function XV	Diff.	Log XV	Diff.
8,410,000	127202	830	5.104494	2843	8,660,000	151894	1161	5.181541	3333
8,420,000	128042	840	5.107352	2858	8,670,000	153071	1177	5.184893	3352
8,430,000	128893	851	5.110229	2877	8,680,000	154267	1196	5.188273	3380
8,440,000	129754	861	5.113121	2892	8,690,000	155480	1213	5.191675	3402
8,450,000	130626	872	5.116030	2909	8,700,000	156712	1232	5.195102	3427
							1250		
8,460,000	131510	884	5.118959	2929	8,710,000	157962	1270	5.198553	3451
8,470,000	132404	894	5.121901	2942	8,720,000	159232	1290	5.202030	3477
8,480,000	133310	906	5.124863	2962	8,730,000	160522	1309	5.205535	3505
8,490,000	134228	918	5.127843	2980	8,740,000	161831	1331	5.209062	3527
8,500,000	135158	930	5.130842	2999	8,750,000	163162		5.212619	3557
							1352		
8,510,000	136101	943	5.133861	3019	8,760,000	164514	1373	5.216203	3584
8,520,000	137055	954	5.136895	3034	8,770,000	165887	1396	5.219812	3609
8,530,000	138023	968	5.139951	3056	8,780,000	167283	1419	5.223452	3640
8,540,000	139003	980	5.143024	3073	8,790,000	168702	1442	5.227120	3668
8,550,000	139997	994	5.146119	3095	8,800,000	170144		5.230817	3697
							1466		
8,560,000	141005	1008	5.149235	3116	8,810,000	171610	1490	5.234543	3726
8,570,000	142026	1021	5.152368	3133	8,820,000	173100	1516	5.238297	3754
8,580,000	143062	1036	5.155524	3156	8,830,000	174616	1542	5.242084	3787
8,590,000	144112	1050	5.158700	3176	8,840,000	176158	1568	5.245902	3818
8,600,000	145176	1064	5.161895	3195	8,850,000	177726		5.249751	3849
							1596		
8,610,000	146256	1080	5.165114	3219	8,860,000	179322	1623	5.253634	3883
8,620,000	147351	1095	5.168353	3239	8,870,000	180945	1652	5.257547	3913
8,630,000	148462	1111	5.171615	3262	8,880,000	182597	1682	5.261494	3947
8,640,000	149590	1128	5.174903	3288	8,890,000	184279	1712	5.265476	3982
8,650,000	150733	1143	5.178208	3305	8,900,000	185991		5.269492	4016

Table 6a. Grid Coverage Nomograph



TO BE SUBTRACTED FROM FIRST TERM

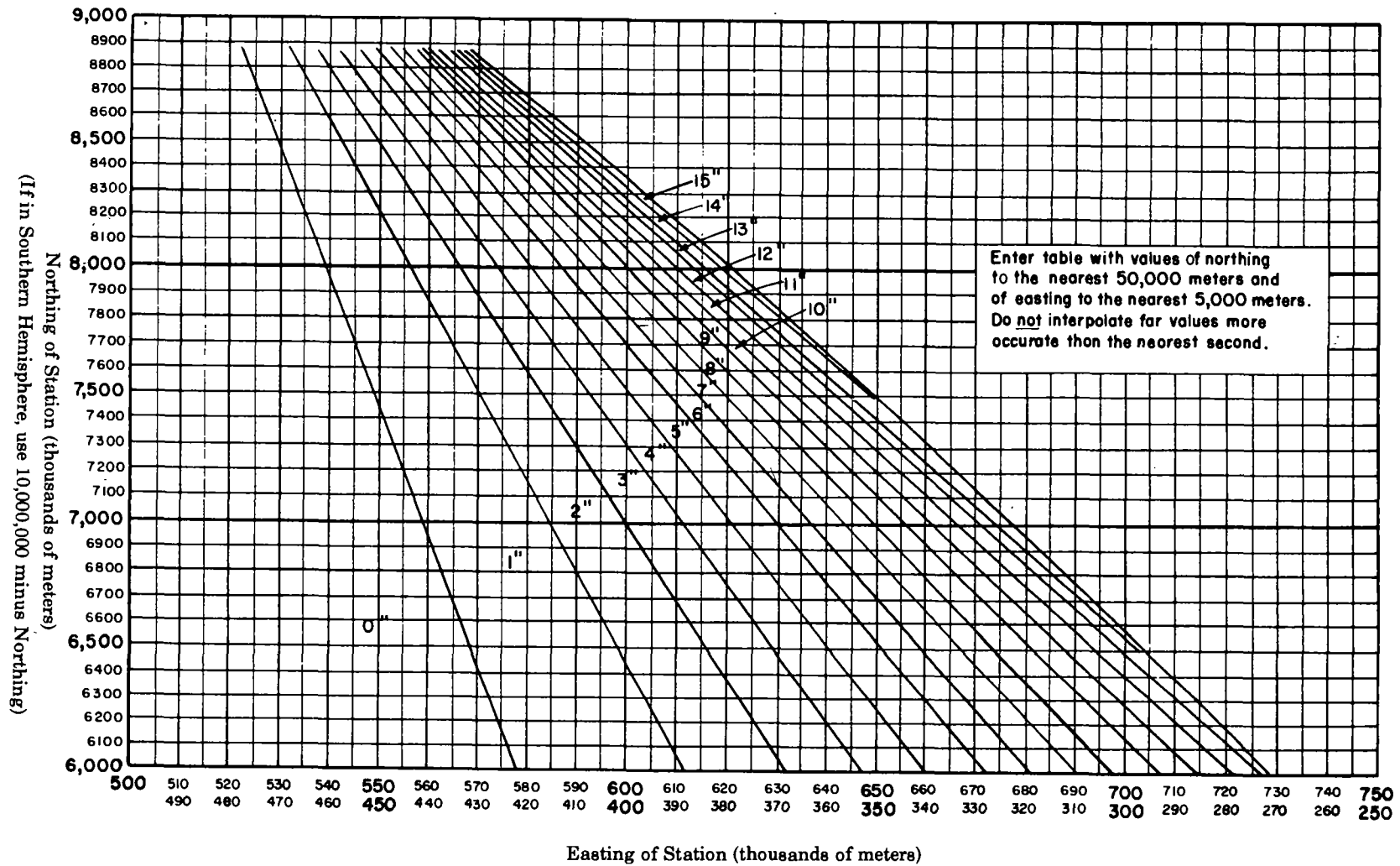


Table 7. Second Term in Convergence Computation. UTM Coordinates

Table 7. Second Term in Convergence Computation. UTM Coordinates—Continued

CONVERSION TABLE	
1"	0.00 m
2"	0.01 m
3"	0.01 m
4"	0.02 m
5"	0.02 m
6"	0.03 m
7"	0.03 m
8"	0.04 m
9"	0.04 m
10"	0.05 m
11"	0.05 m
12"	0.06 m
13"	0.06 m
14"	0.07 m
15"	0.07 m

TO BE SUBTRACTED FROM FIRST TERM

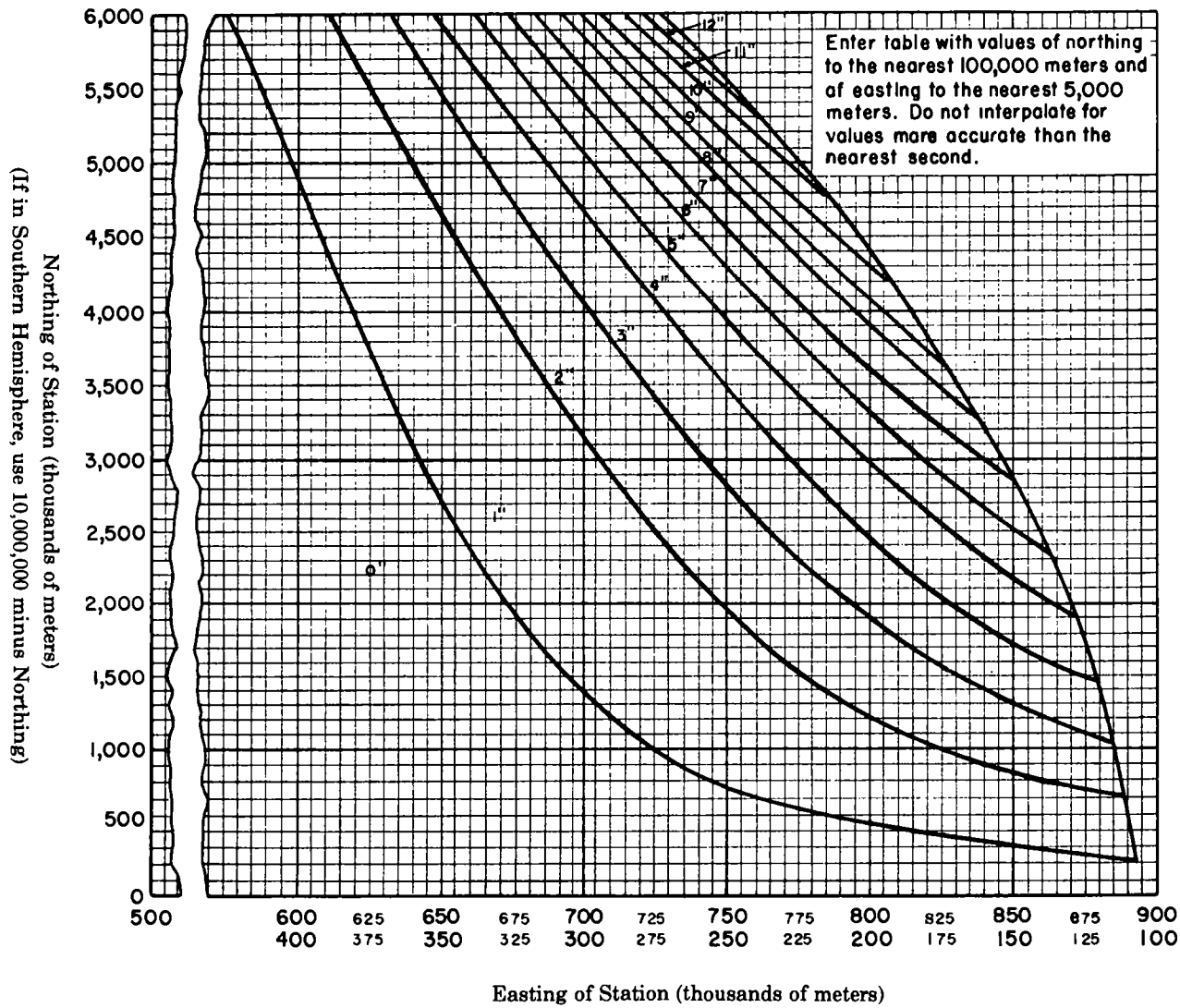


Table 8a. Second Term in Convergence Computation, Geographic Coordinates (Degrees)

TO BE ADDED TO FIRST TERM

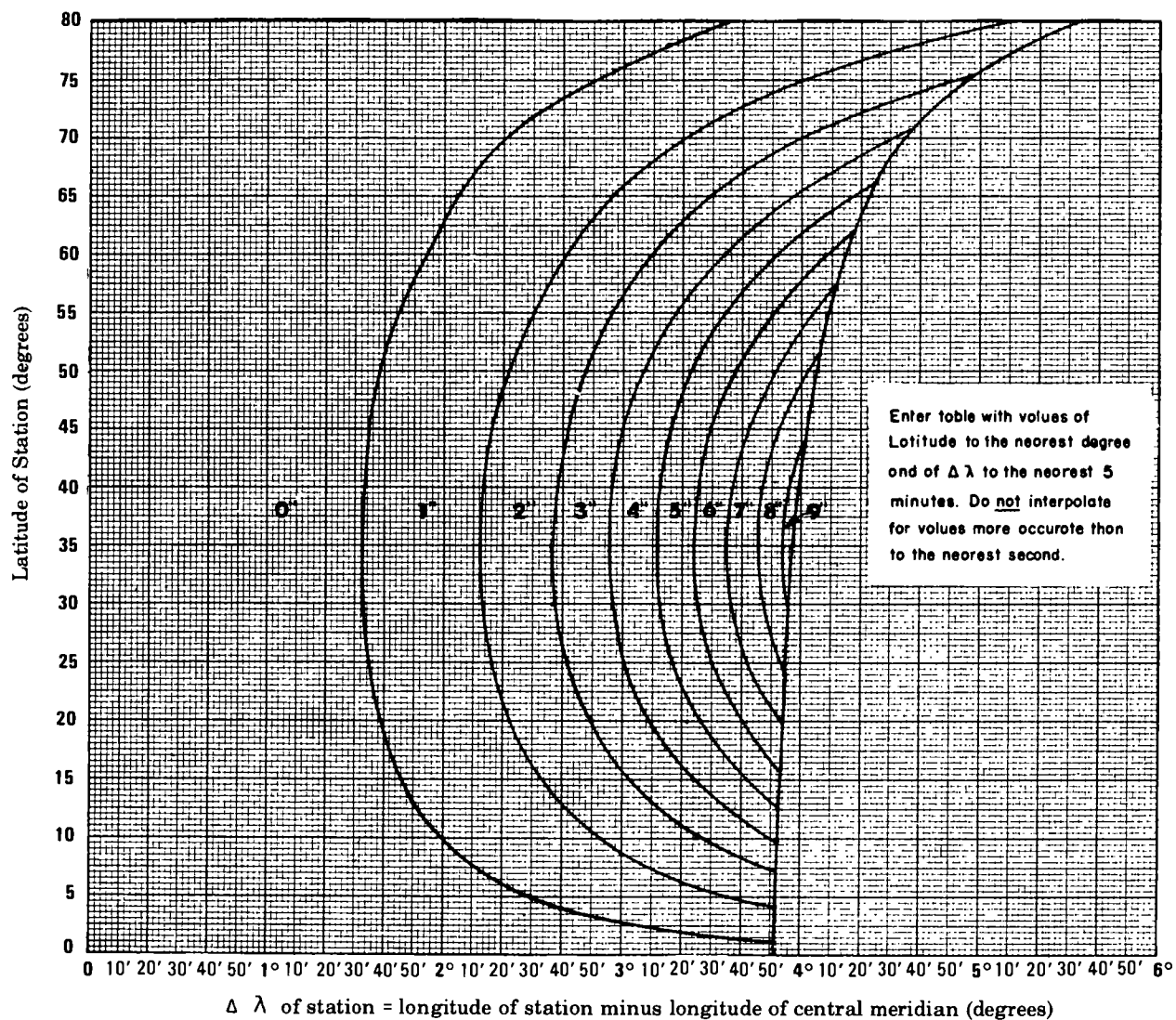


Table 8b. Second Term in Convergence Computation, Geographic Coordinates (Mils)

TO BE ADDED TO FIRST TERM

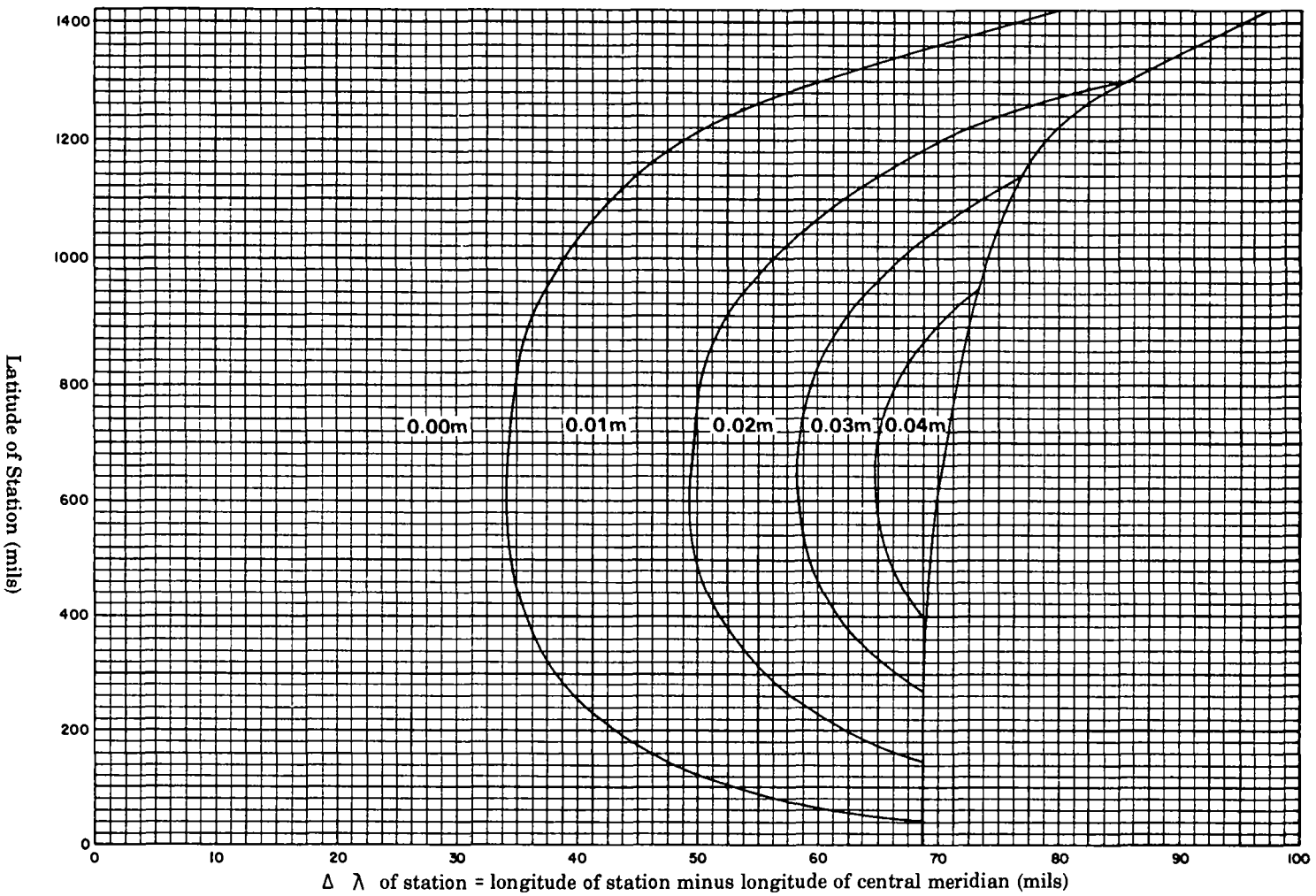


Table 9. Alphabetical Star List

Star	Constellation	No.	Magnitude
Acamar, Theta (θ) Eradani	Eridanus	12	3.4
Achernar, Alpha (α) Eridani	Eridanus	9	0.6
Acrux, Alpha (α) Crucis	Crux	42	1.0
Adhara, Epsilon (ϵ) Canis Majoris	Canis Major	26	1.6
Aldebaran, Alpha (α) Tauri	Taurus	15	1.1
Alhena, Gamma (γ) Geminorum*	Gemini	24	1.9
Alioth, Epsilon (ϵ) Ursae Majoris	Ursa Major	45	1.7
Alkaid, (Benetnasch), Eta (η) Ursae Majoris	Ursa Major	48	1.9
Al Na'ir, Alpha (α) Gruis	Grus	71	2.2
Alnilam, Epsilon (ϵ) Orionis	Orion	20	1.7
Alnitak, Zeta (ζ) Orionis*	Orion	21	2.0
Alpha (α) Ceti, Menkar**	Cetus	13	2.8
Alpha (α) Persei, Mirfak	Perseus	14	1.9
Alpha (α) Tri Aust, Atria	Triangulum Australe	58	1.9
Alphard, Alpha (α) Hydrae	Hydra	35	2.2
Alphecca, Alpha (α) Coronae Bor	Corona Borealis	55	2.3
Alpheratz, Alpha (α) Andromedae	Andromeda	1	2.1
(Al Suhail), Suhail, Lambda (λ) Velorum	Vela (Argo)	33	2.2
Altair, Alpha (α) Aquilae	Aquila	66	0.9
Ankaa, Alpha (α) Phoenicis**	Phoenix	4	2.4
Antares, Alpha (α) Scorpii	Scorpius	57	1.2
Arcturus, Alpha (α) Bootis	Bootes	51	0.2
Atria, Alpha (α) Tri Aust	Triangulum Australe	58	1.9
Avior, Epsilon (ϵ) Carinae	Carina (Argo, Vela)	32	1.7
Bellatrix, Gamma (γ) Orionis	Orion	18	1.7
Beta (β) Centauri, Hadar	Centaurus	49	0.9
Beta (β) Crucis, Mimosa*	Crux	44	1.5
Beta (β) Hydrus	Hydra	3	2.9
Betelgeuse, (Betelgeux), Alpha (α) Orionis	Orion	22	0.1
Canopus, Alpha (α) Carinea	Carina (Argo, Vela)	23	-0.9
Capella, Alpha (α) Aurigae	Auriga	17	0.2
Caph, Beta (β) Cassiopeiae*	Cassiopeia	2	2.4
Castor, Alpha (α) Geminorum*	Gemini	28	1.6
Delta (δ) Canis Majoris, Wezen*	Canis Major	27	2.0
Deneb, Alpha (α) Cygni	Cygnus	68	1.3
Denebola, Beta (β) Leonis	Leo	39	2.2
Diphda, (Deneb Kaitos), Beta (β) Ceti	Cetus	6	2.2
Dschubba, Delta (δ) Scorpii**	Scorpius	56	2.5
Dubhe, Alpha (α) Ursae Majoris	Ursa Major	38	1.9
Elnath, (El Nath), Beta (β) Tauri	Taurus	19	1.8
Eltanin, (Eltamin), Gamma (γ) Draconis	Draco	62	2.4
Enif, Epsilon (ϵ) Pegasi	Pegasus	70	2.5
Epsilon (ϵ) Carinae, Avior	Carina (Argo, Vela)	32	1.7
Fomalhaut, Alpha (α) Piscis Austrini	Piscis Austrinus	72	1.3
Gacrux, Gamma (γ) Crucis	Crux	43	1.6
Gamma (γ) Cassiopeiae*	Cassiopeia	7	1.6—2.8
Gamma (γ) Velorum, (Gamma Argus)*	Vela (Argo)	31	1.9
Gamma (γ) Geminorum, Alhena*	Gemini	24	1.9
Gienah, Gamma (γ) Corvi**	Corvus	41	2.8
Hadar, Beta (β) Centauri	Centaurus	49	0.9
Hamal, Alpha (α) Arietis	Aries	11	2.2
Kaus Australis, Epsilon (ϵ) Sagittarii	Sagittarius	63	1.9

Table 9. Alphabetical Star List—Continued

Star	Constellation	No.	Magnitude
Kochab, Beta (β) Ursae Minoris	Ursa Minor	54	2.2
Markab, Alpha (α) Pegasi	Pegasus	73	2.6
Menkar, Alpha (α) Ceti**	Cetus	13	2.8
Menkent, Theta (θ) Centauri	Centaurus	50	2.3
Merak, Beta (β) Ursae Majoris*	Ursa Major	37	2.4
Miaplacidus, Beta (β) Carinae	Carina (Argo)	34	1.8
Mimosa, Beta (β) Crucis*	Crux	44	1.5
Mirfak, (Marfak), Alpha (α) Persei	Perseus	14	1.9
Mizar, Zeta (ζ) Ursae Majoris*	Ursa Major	46	2.4
Nunki, Sigma (σ) Sagittarii	Sagittarius	65	2.1
(Octantis), Nu (ν) Octantis***	Octans	69	3.7
Peacock, Alpha (α) Pavonis	Pavo	67	2.1
Phecda, Gamma (γ) Ursae Majoris*	Ursa Major	40	2.5
Polaris, Alpha (α) Ursae Minoris***	Ursa Minor	10	2.1
Pollux, Beta (β) Geminorum	Gemini	30	1.2
Procyon, Alpha (α) Canis Minoris	Canis Minor	29	0.5
Rasalhague, Alpha (α) Ophiuchi	Ophiuchus	61	2.1
Regulus, Alpha (α) Leonis	Leo	36	1.3
Rigel, Beta (β) Orionis	Orion	16	0.3
Rigil Kentaurus, Alpha (α) Centauri	Centaurus	52	0.1
Ruchbah, Delta (δ) Cassiopeiae*	Cassiopeia	8	2.8
Sabik, Eta (η) Ophiuchi	Ophiuchus	59	2.6
Scaula, (Shaula), Lambda (λ) Scorpii	Scorpius	60	1.7
Schedar, (Schedir), Alpha (α) Cassiopeiae	Cassiopeia	5	2.3
Sirius, Alpha (α) Canis Majoris	Canis Major	25	-1.6
Spica, Alpha (α) Virginis	Virgo	47	1.2
Suhail, (Al Suhail), Lambda (λ) Velorum	Vela (Argo)	33	2.2
Theta (θ) Centauri, Menkent	Centaurus	50	2.3
Vega, Alpha (α) Lyrae	Lyra	64	0.1
Wezen, Delta (δ) Canis Majoris*	Canis Major	27	2.0
Zeta (ζ) Orionis, Alnitak*	Orion	21	2.0
Zubenelgenubi, Alpha (α) Librae**	Libra	53	2.9

Note. Sirius (magnitude—1.6) is the brightest star listed, Octantis (magnitude 3.7 is the dimmest star listed. Brightness of other stars listed is indicated by their magnitude.

Spelled out names in parentheses are names sometimes used but not recommended.

*Indicates star not on identifier 2012D.

**Indicates star not on identifier 2012C.

***Indicates star not on either identifier.

The constellation Argus has been replaced by its three modern divisions carina, Puppis, and Vela.

Table 10a (1). Apparent Places of Stars, 1988 (Degrees)

Star No.	Right Ascension Declination (° ')	(Hr Min)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
1	RA DEC	00 07 29 01	45.5 37	45.1 33	44.9 29	45.0 25	45.6 23	46.5 25	47.6 30	48.6 38	49.3 46	49.6 52	49.6 57	49.4 60	48.9 59
2	RA DEC	00 08 59 04	30.8 79	29.9 75	29.3 68	29.4 60	30.2 54	31.6 53	33.2 56	34.6 64	35.6 74	36.1 84	35.9 94	35.3 99	34.4 101
3	RA DEC	00 25 -77 18	10.5 98	08.0 92	06.6 83	06.2 72	07.3 60	09.6 51	12.7 46	15.9 46	18.3 51	19.2 60	18.4 69	16.4 74	13.6 75
4	RA DEC	00 25 -42 21	42.1 90	41.6 88	41.3 82	41.3 74	41.8 65	42.7 56	43.9 49	45.1 46	45.9 48	46.3 53	46.3 60	45.9 66	45.3 68
5	RA DEC	00 39 56 28	48.5 36	47.7 34	47.1 28	47.0 20	47.6 15	48.9 12	50.4 15	51.8 21	52.9 31	53.5 40	53.6 50	53.1 56	52.4 58
6	RA DEC	00 42 -18 02	59.5 74	59.2 75	59.0 73	59.0 69	59.4 63	60.1 55	61.1 48	62.1 43	62.9 41	63.3 42	63.4 46	63.2 50	62.9 53
7	RA DEC	00 55 60 39	58.0 27	57.0 25	56.2 20	56.0 12	56.6 05	57.9 02	59.5 03	61.2 09	62.4 18	63.2 28	63.3 38	62.9 45	62.1 48
8	RA DEC	01 24 60 10	61.2 44	60.2 43	59.4 39	59.0 31	59.4 24	60.6 21	62.2 21	63.9 26	65.3 34	66.2 43	66.6 53	66.3 61	65.6 65
9	RA DEC	01 37 -57 17	17.7 64	16.7 64	16.0 59	15.5 49	15.6 39	16.3 28	17.6 20	19.1 16	20.4 17	21.2 23	21.4 32	21.0 40	20.1 45
10	SEE TABLE 11. APPARENT PLACES OF POLARIS, 1988														
11	RA DEC	02 06 23 24	30.1 33	29.8 32	29.4 30	29.1 27	29.3 26	29.9 26	30.9 30	31.9 35	32.9 41	33.6 45	34.0 49	34.1 51	33.9 51
12	RA DEC	02 57 -40 20	49.8 75	49.2 78	48.6 76	48.0 71	47.9 62	48.2 52	49.0 43	50.1 36	51.1 34	52.0 37	52.5 44	52.6 52	52.3 59
13	RA DEC	03 01 04 02	39.9 41	39.6 40	39.2 39	38.9 39	38.9 41	39.3 44	40.1 50	41.0 55	41.9 59	42.7 61	43.2 61	43.5 59	43.4 57
14	RA DEC	03 23 49 49	28.8 27	28.3 29	27.6 28	26.9 24	26.8 19	27.3 14	28.4 12	29.7 14	31.1 17	32.3 23	33.2 29	33.7 36	33.6 41
15	RA DEC	04 35 16 29	15.1 19	15.0 18	14.6 17	14.1 17	13.8 17	14.0 17	14.6 19	15.5 22	16.4 25	17.4 27	18.2 27	18.7 27	19.0 26
16	RA DEC	05 13 -08 12	59.0 48	58.9 52	58.5 54	58.0 54	57.6 51	57.6 47	58.1 41	58.8 35	59.6 32	60.5 31	61.4 34	62.0 38	62.2 44
17	RA DEC	05 15 45 59	49.9 25	49.8 29	49.3 31	48.5 30	48.0 27	48.1 22	48.7 19	49.8 17	51.0 16	52.3 17	53.6 20	54.4 24	54.9 28
18	RA DEC	05 24 06 20	30.6 30	30.6 28	30.2 27	29.7 27	29.3 27	29.3 29	29.8 33	30.5 36	31.4 39	32.3 40	33.2 38	33.8 36	34.2 33
19	RA DEC	05 25 28 36	33.5 03	33.5 05	33.1 05	32.5 05	32.1 04	32.2 02	32.7 01	33.5 02	34.5 02	35.5 03	36.6 04	37.3 05	37.7 06
20	RA DEC	05 35 -01 12	37.6 25	37.6 29	37.3 30	36.7 30	36.4 29	36.3 26	36.7 21	37.4 17	38.2 14	39.1 13	40.0 15	40.7 19	41.0 24
21	RA DEC	05 40 -01 56	10.6 48	10.5 51	10.2 53	09.7 53	09.3 51	09.2 48	09.6 44	10.3 39	11.1 36	12.0 35	12.9 37	13.6 41	13.9 46
22	RA DEC	05 54 07 24	32.8 28	32.8 25	32.5 24	32.0 24	31.6 25	31.5 27	31.9 29	32.5 33	33.4 35	34.3 35	35.2 34	35.9 31	36.4 27
23	RA DEC	06 23 -52 40	43.4 73	43.2 83	42.4 89	41.3 91	40.3 88	39.7 81	39.7 71	40.2 61	41.2 54	42.4 53	43.6 57	44.5 65	44.9 76
24	RA DEC	06 37 16 24	02.7 44	02.9 43	02.6 43	02.1 43	01.7 43	01.5 44	01.8 44	02.4 46	03.2 46	04.1 46	05.1 44	06.0 42	06.5 40
25	RA DEC	06 44 -16 41	38.7 50	38.8 57	38.5 61	37.9 62	37.4 60	37.2 56	37.3 51	37.8 44	38.5 40	39.3 39	40.3 42	41.1 48	41.6 56

Table 10a (1). Apparent Places of Stars, 1988 (Degrees)—Continued

Star No.	Right ascen- sion Decli- nation (°)	(Hr Min)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
26	RA DEC	06 58 28 56	10.8 71	10.9 80	10.6 85	09.9 87	09.3 86	09.0 81	09.0 74	09.4 66	10.1 60	11.0 58	12.0 61	12.9 68	13.4 77
27	RA DEC	07 07 26 22	55.7 17	55.8 26	55.5 31	54.9 33	54.3 32	54.0 27	54.0 21	54.4 13	55.1 08	56.0 06	57.0 09	57.8 15	58.4 24
28	RA DEC	07 33 31 54	51.9 59	52.3 61	52.2 63	51.7 65	51.1 66	50.8 65	50.9 63	51.4 60	52.1 57	53.1 55	54.3 52	55.3 50	56.2 50
29	RA DEC	07 38 05 15	41.9 29	42.2 25	42.1 23	41.7 23	41.2 23	40.9 25	41.0 27	41.4 29	42.0 31	42.8 30	43.8 27	44.7 23	45.4 18
30	RA DEC	07 44 28 03	36.7 24	37.1 25	37.0 27	36.5 29	36.0 29	35.7 29	35.8 27	36.2 26	36.9 23	37.8 21	38.9 17	39.9 15	40.7 14
31	RA DEC	08 09 47 17	11.4 51	11.7 63	11.4 71	10.6 77	09.8 78	09.1 74	08.7 68	08.8 59	09.3 51	10.3 46	11.5 47	12.6 54	13.5 64
32	RA DEC	08 22 59 27	18.1 61	18.4 72	17.9 82	16.9 89	15.7 91	14.6 88	14.0 82	13.8 72	14.4 63	15.5 58	17.0 58	18.4 64	19.5 74
33	RA DEC	09 07 43 22	34.4 48	35.0 60	35.0 69	34.5 76	33.8 78	33.1 77	32.7 72	32.6 64	32.9 56	33.7 51	34.7 51	35.9 56	36.9 65
34	RA DEC	09 13 69 39	06.4 47	07.2 59	06.8 70	05.5 79	03.8 83	02.1 83	0 .8 79	0 .1 70	0 .3 61	01.5 54	03.5 51	05.6 55	07.2 64
35	RA DEC	09 27 08 36	0 .9 17	01.5 24	01.7 29	01.4 31	01.0 31	0 .7 30	0 .5 27	0 .6 24	0 .8 21	01.4 20	02.3 22	03.3 28	04.2 35
36	RA DEC	10 07 12 01	45.1 33	45.8 29	46.2 28	46.1 28	45.7 30	45.4 32	45.2 33	45.1 33	45.3 32	45.8 29	46.6 24	47.6 19	48.6 13
37	RA DEC	11 01 56 26	09.3 34	10.7 35	11.4 41	11.4 48	10.8 54	10.0 57	09.3 56	08.9 51	08.8 43	09.2 33	10.2 23	11.6 16	13.3 12
38	RA DEC	11 03 61 48	01.9 41	03.5 43	04.3 49	04.3 57	03.6 64	02.6 67	01.7 65	01.1 59	01.0 50	01.4 40	02.6 30	04.2 23	06.0 20
39	RA DEC	11 48 14 37	27.4 74	28.4 70	29.0 68	29.2 69	29.1 72	28.8 74	28.5 76	28.3 76	28.2 75	28.4 71	28.9 65	29.8 59	30.8 52
40	RA DEC	11 53 53 45	13.5 24	14.9 23	15.8 27	16.0 35	15.7 42	15.0 46	14.4 47	13.8 43	13.4 36	13.6 27	14.3 16	15.4 07	16.9 02
41	RA DEC	12 15 17 28	11.3 27	12.3 35	13.0 41	13.2 46	13.2 49	13.0 49	12.8 48	12.5 46	12.3 43	12.3 40	12.8 41	13.7 44	14.7 50
42	RA DEC	12 25 63 01	54.6 41	56.4 49	57.5 58	58.0 69	57.9 78	57.2 85	56.3 87	55.3 85	54.5 78	54.4 71	55.2 64	56.6 61	58.5 63
43	RA DEC	12 30 57 02	29.0 31	30.5 39	31.5 48	32.0 58	31.9 67	31.5 73	30.8 75	30.0 73	29.4 66	29.3 59	29.9 53	31.2 51	32.8 53
44	RA DEC	12 46 59 37	59.9 09	61.6 16	62.7 25	63.3 35	63.3 44	62.9 51	62.2 54	61.2 52	60.5 46	60.3 39	60.9 32	62.2 29	63.9 31
45	RA DEC	12 53 56 00	30.9 69	32.5 67	33.6 69	34.2 77	34.1 85	33.5 91	32.8 94	32.0 92	31.3 86	31.1 77	31.4 65	32.4 55	33.8 48
46	RA DEC	13 23 54 58	27.0 55	28.5 52	29.7 54	30.3 60	30.4 69	30.0 76	29.3 79	28.5 78	27.7 73	27.3 65	27.5 54	28.3 43	29.6 35
47	RA DEC	13 24 11 05	33.2 57	34.3 64	35.1 69	35.6 72	35.8 74	35.8 73	35.6 73	35.3 71	35.0 69	34.9 68	35.1 69	35.8 72	36.8 78
48	RA DEC	13 47 49 21	04.1 63	05.5 58	06.6 59	07.3 64	07.5 72	07.2 80	06.7 84	06.0 84	05.3 81	04.9 73	05.0 63	05.6 52	06.7 43
49	RA DEC	14 02 60 18	56.4 45	58.3 48	59.8 55	60.8 64	61.4 73	61.4 81	60.9 86	60.0 87	59.0 83	58.5 77	58.7 70	59.6 65	61.2 64

Table 10a (1). Apparent Places of Stars, 1988 (Degrees)—Continued

Star No.	Right ascen- sion Decli- nation (°')	(Hr Min)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
50	RA DEC	14 05 36 18	57.5 36	58.7 41	59.7 47	60.5 54	60.8 59	60.9 63	60.8 65	60.3 65	59.8 62	59.5 58	59.7 55	60.4 53	61.4 55
51	RA DEC	14 15 19 14	06.4 28	07.5 21	08.4 19	09.0 20	09.3 24	09.4 29	09.2 32	08.8 34	08.4 33	08.1 30	08.2 24	08.6 16	09.5 07
52	RA DEC	14 38 60 47	44.7 02	46.6 04	48.2 09	49.4 18	50.1 26	50.3 34	49.9 39	49.1 41	48.0 39	47.3 34	47.2 26	47.9 21	49.4 18
53	RA DEC	14 50 15 59	11.9 35	13.0 41	14.0 45	14.7 49	15.2 50	15.4 51	15.4 50	15.1 49	14.7 48	14.3 46	14.4 46	14.8 48	15.7 52
54	RA DEC	14 50 74 11	42.5 53	45.1 48	47.5 48	49.5 54	50.2 63	49.6 73	48.0 79	45.8 80	43.4 77	41.5 70	40.5 59	40.7 47	42.4 37
55	RA DEC	15 34 26 44	09.9 62	10.9 54	11.9 51	12.7 53	13.3 58	13.5 65	13.5 71	13.1 74	12.6 75	12.1 72	11.9 66	12.1 58	12.7 49
56	RA DEC	15 59 22 35	36.1 21	37.2 24	38.2 28	39.1 31	39.8 32	40.3 33	40.4 34	40.2 34	39.8 33	39.3 32	39.2 31	39.4 31	40.1 32
57	RA DEC	16 28 26 24	38.9 26	39.9 28	40.9 31	41.9 33	42.7 35	43.3 36	43.5 38	43.4 38	42.9 38	42.4 37	42.2 35	42.3 34	43.0 35
58	RA DEC	16 47 69 00	19.6 25	21.7 21	24.0 20	26.4 23	28.2 29	29.5 37	29.9 44	29.3 51	28.0 53	26.5 52	25.6 46	25.6 38	26.7 31
59	RA DEC	17 09 15 42	40.0 45	40.8 47	41.8 50	42.7 51	43.5 51	44.2 49	44.5 48	44.5 48	44.1 47	43.6 47	43.3 47	43.3 47	43.8 49
60	RA DEC	17 32 37 05	46.0 51	46.9 50	48.0 50	49.2 51	50.2 52	51.1 54	51.5 57	51.5 60	51.1 61	50.5 61	50.1 59	50.0 56	50.5 54
61	RA DEC	17 34 12 33	21.3 54	22.1 48	22.9 44	23.8 43	24.6 47	25.3 52	25.6 58	25.5 63	25.1 66	24.6 66	24.2 64	24.1 59	24.4 52
62	RA DEC	17 56 51 28	17.5 72	18.2 62	19.2 56	20.5 55	21.6 60	22.3 69	22.6 79	22.3 88	21.4 93	20.4 94	19.5 90	19.0 82	19.0 72
63	RA DEC	18 23 34 23	21.0 37	21.8 35	22.8 34	23.9 33	25.0 33	25.9 33	26.6 35	26.7 37	26.4 39	25.9 40	25.4 39	25.2 37	25.5 35
64	RA DEC	18 36 38 45	30.1 70	30.7 61	31.5 54	32.5 53	33.5 57	34.3 65	34.8 74	34.7 83	34.3 89	33.6 91	32.8 89	32.4 83	32.4 74
65	RA DEC	18 54 26 18	29.9 55	30.6 54	31.4 53	32.4 52	33.4 50	34.4 48	35.0 48	35.3 49	35.1 50	34.6 51	34.1 51	33.9 50	34.1 49
66	RA DEC	19 50 08 49	10.6 62	10.9 57	11.5 54	12.3 53	13.2 56	14.1 62	14.8 68	15.2 74	15.1 79	14.7 81	14.2 80	13.9 78	13.8 73
67	RA DEC	20 24 56 46	40.6 43	41.0 35	41.9 28	43.2 22	44.8 18	46.4 17	47.7 19	48.4 24	48.4 30	47.8 35	46.9 37	46.2 35	45.8 29
68	RA DEC	20 40 45 13	59.4 74	59.4 65	59.8 58	60.7 53	61.8 53	62.9 59	63.8 68	64.2 79	64.1 88	63.6 95	62.8 97	62.1 95	61.6 89
69	RA DEC	21 40 77 26	08.5 58	07.9 48	08.8 38	11.0 28	14.0 21	17.5 18	20.8 20	23.1 26	23.6 34	22.5 42	20.2 46	17.6 46	15.6 40
★70	RA DEC	21 43 09 49	34.8 07	34.8 04	35.1 01	35.6 00	36.4 02	37.4 08	38.3 14	39.0 21	39.2 26	39.1 30	38.7 31	38.3 29	38.0 26
★71	RA DEC	22 07 47 00	28.3 87	28.2 81	28.5 75	29.1 66	30.2 59	31.5 54	32.8 51	33.8 53	34.2 57	34.1 63	33.5 67	32.9 69	32.4 67
72	RA DEC	22 56 29 40	59.1 82	59.0 80	59.0 76	59.4 70	60.1 63	61.2 56	62.3 51	63.2 49	63.7 50	63.8 53	63.6 57	63.2 60	62.8 61
73	RA DEC	23 04 15 08	09.1 28	08.9 24	08.9 21	09.3 19	09.9 20	10.9 25	11.9 32	12.7 39	13.2 45	13.3 50	13.1 52	12.8 52	12.4 49

Table 10a (2). Apparent Places of Stars, 1989 (Degrees)

Star No.	Right ascen- sion Declina- tion (°')	(Hr Min)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
1	RA DEC	00 07 29 01	48.9 59	48.6 55	48.4 51	48.5 47	49.1 45	50.0 47	51.1 52	52.1 60	52.8 68	53.1 74	53.1 79	52.8 81	52.4 81
2	RA DEC	00 08 59 05	34.4 41	33.5 37	33.0 30	33.1 22	33.9 17	35.2 15	36.9 18	38.4 26	39.3 36	39.7 46	39.6 55	39.0 61	38.1 63
3	RA DEC	00 25 77 18	13.6 75	11.1 70	09.6 61	09.3 49	10.4 38	12.7 29	15.6 24	18.9 24	21.3 29	22.2 38	21.3 47	19.3 52	16.6 53
4	RA DEC	00 25 42 21	45.3 68	44.8 66	44.5 61	44.5 53	45.0 43	45.9 34	47.1 28	48.2 25	49.1 27	49.5 32	49.4 39	49.0 44	48.5 47
5	RA DEC	00 39 56 28	52.4 58	51.5 55	51.0 50	50.9 42	51.5 36	52.7 34	54.2 36	55.7 43	56.8 52	57.4 62	57.4 71	57.1 77	56.3 80
6	RA DEC	00 43 18 02	02.9 53	02.5 53	02.3 51	02.3 47	02.7 41	03.4 33	04.4 27	05.4 21	06.2 20	06.6 21	06.6 25	06.5 28	06.2 31
7	RA DEC	00 56 60 39	02.1 48	01.1 46	0 .3 41	0 .2 33	0 .7 26	02.0 23	03.7 24	05.4 30	06.6 39	07.3 49	07.5 59	07.1 66	06.3 69
8	RA DEC	01 25 60 10	05.6 65	04.6 64	03.8 59	03.5 52	03.9 45	05.1 41	06.7 41	08.4 46	09.8 54	10.7 63	11.0 73	10.8 80	10.1 85
9	RA DEC	01 37 57 16	20.1 105	19.1 104	18.3 99	17.9 90	18.0 79	18.7 68	19.9 60	21.4 56	22.7 58	23.5 64	23.7 73	23.3 81	22.4 85
10			SEE TABLE 11. APPARENT PLACES OF POLARIS, 1989												
11	RA DEC	02 06 23 24	33.9 51	33.5 50	33.1 48	32.9 45	33.1 44	33.7 45	34.6 48	35.7 53	36.7 59	37.3 63	37.7 67	37.8 69	37.7 69
12	RA DEC	02 57 40 20	52.3 59	51.7 62	51.1 61	50.5 56	50.4 47	50.7 37	51.4 28	52.5 21	53.6 19	54.4 22	55.0 29	55.1 38	54.8 44
13	RA DEC	03 01 04 02	43.4 57	43.1 54	42.7 53	42.4 54	42.4 56	42.7 59	43.5 64	44.5 69	45.4 74	46.1 75	46.7 75	46.9 73	46.9 71
14	RA DEC	03 23 49 49	33.6 41	33.0 43	32.4 42	31.8 38	31.6 32	32.1 28	33.1 25	34.5 26	35.9 30	37.1 36	38.0 42	38.4 48	38.4 53
15	RA DEC	04 35 16 29	19.0 26	18.8 25	18.4 24	17.9 24	17.7 24	17.8 24	18.4 26	19.3 29	20.2 32	21.1 33	22.0 34	22.5 33	22.8 32
16	RA DEC	05 14 08 12	02.2 44	02.1 48	01.7 50	01.2 50	0 .8 48	0 .8 43	01.2 38	02.0 32	02.8 28	03.7 28	04.5 31	05.1 36	05.4 41
17	RA DEC	05 15 45 59	54.9 28	54.7 32	54.2 34	53.5 33	53.0 30	53.0 25	53.6 21	54.7 19	55.9 19	57.2 20	58.4 22	59.3 26	59.8 31
18	RA DEC	05 24 06 20	34.2 33	34.1 30	33.7 29	33.2 29	32.9 30	32.9 32	33.3 35	34.1 38	34.9 41	35.8 42	36.7 40	37.4 38	37.7 35
19	RA DEC	05 25 28 36	37.7 06	37.6 07	37.3 08	36.7 07	36.3 06	36.3 04	36.8 03	37.7 03	38.7 04	39.7 05	40.7 06	41.5 06	41.9 08
20	RA DEC	05 35 01 12	41.0 24	41.0 27	40.6 29	40.1 29	39.8 27	39.7 24	40.1 20	40.8 16	41.6 12	42.5 12	43.3 14	44.0 18	44.4 23
21	RA DEC	05 40 01 56	13.9 46	13.9 50	13.5 52	13.0 52	12.7 50	12.6 47	12.9 43	13.6 38	14.5 35	15.3 35	16.2 37	16.9 41	17.3 46
22	RA DEC	05 54 07 24	36.4 27	36.4 25	36.1 24	35.6 24	35.2 24	35.1 26	35.4 29	36.1 32	37.0 34	37.8 34	38.7 33	39.5 30	40.0 26
23	RA DEC	06 23 52 40	44.9 76	44.6 86	43.9 92	42.8 94	41.8 91	41.2 84	41.1 75	41.7 65	42.6 58	43.8 56	45.1 60	46.0 69	46.4 80
24	RA DEC	06 37 16 24	06.5 40	06.7 38	06.4 38	06.0 38	05.5 39	05.3 39	05.6 40	06.2 41	07.0 41	07.9 41	08.9 39	09.7 36	10.4 34
25	RA DEC	06 44 16 41	41.6 56	41.7 63	41.4 67	40.8 69	40.3 67	40.1 63	40.2 57	40.7 51	41.4 47	42.2 46	43.2 49	44.0 55	44.5 63

Table 10a (2). Apparent Places of Stars, 1989 (Degrees)—Continued

Star No.	Right Ascension Declination (° ')	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH													
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	
		Seconds (time of RA or arc of declination)													
26	RA DEC	06 58 -28 57	13.4 17	13.5 26	13.2 31	12.5 34	12.0 32	11.6 27	11.6 20	12.0 13	12.7 07	13.6 05	14.6 08	15.5 15	16.0 24
27	RA DEC	07 07 -26 22	58.4 24	58.5 33	58.2 38	57.7 41	57.1 39	56.7 35	56.7 28	57.1 21	57.8 15	58.7 13	59.6 16	60.5 23	61.1 32
28	RA DEC	07 33 -31 54	56.2 50	56.5 51	56.4 54	55.9 55	55.4 56	55.0 55	55.1 53	55.6 50	56.4 47	57.3 45	58.4 42	59.5 40	60.3 40
29	RA DEC	07 38 -05 15	45.4 18	45.7 14	45.6 12	45.2 12	44.7 12	44.4 14	44.5 16	44.8 18	45.4 19	46.2 19	47.2 15	48.1 11	48.8 06
30	RA DEC	07 44 -28 03	40.7 14	41.1 15	41.0 16	40.6 18	40.1 19	39.7 18	39.8 17	40.2 15	40.9 12	41.8 10	42.8 07	43.9 04	44.8 03
31	RA DEC	08 09 -47 17	13.5 64	13.7 75	13.4 84	12.7 89	11.9 90	11.1 87	10.8 81	10.9 72	11.4 64	12.3 59	13.5 60	14.7 67	15.6 77
32	RA DEC	08 22 -59 28	19.5 14	19.8 26	19.3 36	18.3 43	17.1 45	16.0 42	15.4 35	15.3 26	15.8 17	16.9 12	18.4 12	19.9 18	20.9 28
33	RA DEC	09 07 -43 23	36.9 05	37.5 16	37.4 25	37.0 32	36.3 35	35.6 34	35.2 29	35.1 21	35.4 14	36.1 08	37.2 08	38.4 13	39.4 22
34	RA DEC	09 13 -69 40	07.2 04	08.0 16	07.6 26	06.4 36	04.7 40	03.0 40	01.6 36	01.0 27	01.2 18	02.4 11	04.4 08	06.5 12	08.2 21
35	RA DEC	09 27 -08 36	04.2 35	04.8 42	04.9 46	04.7 49	04.3 50	04.0 48	03.8 45	03.8 42	04.1 39	04.7 38	05.5 40	06.5 46	07.4 53
36	RA DEC	10 07 -12 00	48.6 73	49.4 69	49.7 68	49.6 68	49.3 70	48.9 72	48.7 73	48.7 73	48.8 72	49.3 69	50.1 65	51.1 59	52.1 53
37	RA DEC	11 01 -56 25	13.3 72	14.6 74	15.2 79	15.3 86	14.7 93	13.9 96	13.1 94	12.7 89	12.6 81	13.0 71	14.0 62	15.4 54	17.1 51
38	RA DEC	11 03 -61 47	06.0 80	07.5 82	08.2 88	08.2 96	07.6 102	06.5 105	05.6 103	05.0 97	04.9 89	05.3 79	06.4 69	08.0 61	09.8 58
39	RA DEC	11 48 -14 37	30.8 52	31.8 47	32.3 46	32.6 47	32.5 49	32.2 52	31.9 54	31.7 54	31.6 53	31.7 49	32.2 44	33.1 37	34.2 30
40	RA DEC	11 53 -53 44	16.9 62	18.3 61	19.1 65	19.4 72	19.1 79	18.4 84	17.7 85	17.1 81	16.8 74	16.9 65	17.5 54	18.7 45	20.2 39
41	RA DEC	12 15 -17 28	14.7 50	15.7 57	16.4 63	16.7 68	16.7 71	16.5 71	16.2 70	15.9 68	15.7 65	15.8 62	16.2 62	17.1 65	18.2 72
42	RA DEC	12 25 -63 02	58.5 03	60.3 11	61.3 20	61.9 31	61.7 41	61.1 47	60.2 49	59.2 47	58.4 40	58.3 32	59.0 25	60.5 22	62.4 25
43	RA DEC	12 30 -57 02	32.8 53	34.3 61	35.3 70	35.8 81	35.8 89	35.3 95	34.6 97	33.8 95	33.2 89	33.1 81	33.7 75	35.0 72	36.6 75
44	RA DEC	12 47 -59 37	03.9 31	05.6 37	06.7 46	07.3 57	07.4 66	06.9 72	06.2 75	05.3 73	04.6 68	04.3 60	04.9 53	06.2 50	08.0 52
45	RA DEC	12 53 -56 00	33.8 48	35.3 45	36.4 48	37.0 55	36.9 63	36.3 70	35.5 72	34.7 70	34.1 64	33.8 55	34.1 44	35.1 34	36.5 26
46	RA DEC	13 23 -54 58	29.6 35	31.1 31	32.2 33	32.9 40	33.0 48	32.5 55	31.8 59	31.0 58	30.3 53	29.9 45	30.0 34	30.8 23	32.1 15
47	RA DEC	13 24 -11 06	36.8 18	37.8 24	38.6 29	39.2 33	39.4 34	39.3 34	39.1 33	38.8 31	38.5 29	38.4 28	38.6 29	39.3 32	40.3 38
48	RA DEC	13 47 -49 21	06.7 43	08.1 38	09.1 39	09.9 45	10.1 53	09.8 60	09.2 65	08.5 65	07.8 61	07.4 54	07.4 44	08.0 33	09.2 24
49	RA DEC	14 03 -60 19	01.2 04	03.1 07	04.5 14	05.7 23	06.2 32	06.2 40	05.7 44	04.8 45	03.9 42	03.3 35	03.5 28	04.4 23	06.1 22

Table 10a (2). Apparent Places of Stars, 1989 (Degrees)—Continued

Star No.	Right ascen- sion Declina- tion (°')	(Hr Min)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
50	RA DEC	14 06 36 18	01.4 55	02.7 60	03.7 66	04.5 73	04.8 78	04.9 82	04.7 84	04.3 84	03.8 81	03.5 77	03.6 73	04.3 71	05.4 73
51	RA DEC	14 15 19 13	09.5 67	10.5 61	11.4 59	12.1 60	12.4 64	12.4 69	12.2 73	11.8 74	11.4 74	11.1 70	11.1 64	11.6 57	12.5 48
52	RA DEC	14 38 60 47	49.4 18	51.3 20	52.8 25	54.1 33	54.8 42	55.0 49	54.6 55	53.8 57	52.7 55	51.9 49	51.8 42	52.6 36	54.1 33
53	RA DEC	14 50 15 59	15.7 52	16.7 56	17.6 61	18.4 64	18.9 66	19.1 66	19.1 66	18.8 65	18.4 63	18.0 62	18.0 61	18.5 63	19.3 67
54	RA DEC	14 50 74 11	42.4 37	44.9 32	47.2 32	49.1 38	49.9 47	49.3 57	47.7 63	45.4 65	43.1 62	41.2 55	40.1 44	40.3 32	41.9 22
55	RA DEC	15 34 26 44	12.7 49	13.7 42	14.7 39	15.5 40	16.1 45	16.3 52	16.3 58	15.9 62	15.4 63	14.8 60	14.6 54	14.8 46	15.5 37
56	RA DEC	15 59 22 35	40.1 32	41.1 35	42.1 38	43.1 41	43.8 43	44.2 44	44.4 44	44.2 44	43.7 44	43.3 42	43.0 40	43.3 40	44.1 42
57	RA DEC	16 28 26 24	43.0 35	44.0 36	45.0 39	46.0 41	46.8 43	47.4 44	47.6 45	47.5 46	47.0 46	46.5 44	46.2 42	46.4 41	47.1 42
58	RA DEC	16 47 69 00	26.7 31	28.8 27	31.0 26	33.5 29	35.4 35	36.6 43	37.0 50	36.5 56	35.1 59	33.6 57	32.6 51	32.6 44	33.8 37
59	RA DEC	17 09 15 42	43.8 49	44.6 52	45.5 54	46.5 55	47.4 54	48.0 53	48.3 52	48.3 51	47.9 51	47.4 50	47.0 50	47.1 50	47.6 52
60	RA DEC	17 32 37 05	50.5 54	51.5 52	52.5 52	53.7 53	54.8 54	55.6 56	56.0 58	56.1 61	55.6 63	55.0 62	54.5 60	54.5 57	55.0 55
61	RA DEC	17 34 12 33	24.4 52	25.2 46	26.0 42	26.9 42	27.7 45	28.3 51	28.7 57	28.6 62	28.2 64	27.7 65	27.2 62	27.2 58	27.5 51
62	RA DEC	17 56 51 28	19.0 72	19.7 62	20.7 56	22.0 56	23.1 61	23.9 70	24.1 80	23.8 89	23.0 94	22.0 95	21.0 91	20.5 84	20.6 73
63	RA DEC	18 23 34 23	25.5 35	26.2 32	27.2 31	28.3 30	29.4 30	30.3 30	30.9 32	31.1 34	30.8 36	30.2 36	29.7 35	29.5 33	29.8 31
64	RA DEC	18 36 38 45	32.4 74	32.9 65	33.7 59	34.8 58	35.8 61	36.6 69	37.0 79	37.0 88	36.5 94	35.8 96	35.1 94	34.6 89	34.7 79
65	RA DEC	18 54 26 18	34.1 49	34.7 48	35.5 47	36.5 45	37.5 44	38.4 42	39.1 42	39.4 42	39.2 44	38.7 44	38.2 44	37.9 43	38.1 43
66	RA DEC	19 50 08 50	13.8 13	14.2 09	14.7 05	15.6 05	16.5 08	17.4 13	18.0 20	18.4 26	18.3 30	17.9 32	17.4 32	17.1 30	17.1 25
67	RA DEC	20 24 56 46	45.8 29	46.2 22	47.0 15	48.4 08	50.0 04	51.5 03	52.8 05	53.6 10	53.6 16	52.9 21	52.0 23	51.2 21	51.0 15
68	RA DEC	20 41 45 14	01.6 29	01.7 20	02.1 12	03.0 08	04.1 08	05.2 14	06.1 23	06.6 34	06.4 43	05.9 50	05.1 53	04.4 51	04.0 44
69	RA DEC	21 40 77 26	15.6 40	14.9 30	15.7 20	17.9 10	21.0 03	24.5 00	27.7 01	30.0 07	30.6 15	29.4 23	27.0 28	24.4 27	22.4 21
★ 70	RA DEC	21 43 09 49	38.0 26	38.0 22	38.3 19	38.9 19	39.7 21	40.7 26	41.6 33	42.2 40	42.5 45	42.3 48	41.9 49	41.6 48	41.3 45
★ 71	RA DEC	22 07 47 00	32.4 67	32.3 62	32.5 55	33.2 47	34.3 39	35.6 34	36.8 31	37.8 33	38.3 37	38.1 43	37.6 48	36.9 49	36.5 47
72	RA DEC	22 57 29 40	02.8 61	02.6 59	02.6 55	03.0 48	03.8 41	04.8 34	05.8 29	06.8 27	07.3 28	07.4 32	07.1 36	06.7 39	06.4 39
73	RA DEC	23 04 15 08	12.4 49	12.2 46	12.2 43	12.6 41	13.3 42	14.2 47	15.2 53	16.0 61	16.5 67	16.6 71	16.4 74	16.1 74	15.8 71

Table 10a (3). Apparent Places of Stars, 1990 (Degrees)

Star No.	Right ascension Declination (°')	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
		Seconds (time of RA or arc of declination)												
1	RA DEC 00 07 29 02	52.4 21	52.0 17	51.8 13	52.0 08	52.5 07	53.5 09	54.5 14	55.5 21	56.2 29	56.5 36	56.5 40	56.2 42	55.9 42
2	RA DEC 00 08 59 05	38.1 63	37.2 59	36.7 52	36.8 44	37.6 38	39.0 36	40.5 40	42.0 47	43.1 57	43.5 67	43.3 76	42.7 82	41.9 84
3	RA DEC 00 25 77 18	16.6 53	14.0 48	12.5 40	12.1 28	13.1 16	15.4 07	18.4 02	21.5 02	23.9 07	24.8 16	24.0 25	21.9 31	19.1 32
4	RA DEC 00 25 42 21	48.5 47	47.9 45	47.6 40	47.6 32	48.1 22	49.0 13	50.1 07	51.3 04	52.2 06	52.6 11	52.5 18	52.1 24	51.5 26
5	RA DEC 00 39 56 28	56.3 80	55.4 77	54.9 71	54.8 63	55.5 58	56.7 55	58.1 57	59.6 64	60.8 73	61.3 83	61.3 92	61.0 98	60.3 100
6	RA DEC 00 43 18 01	06.2 91	05.8 92	05.5 90	05.6 86	05.9 80	06.7 72	07.6 66	08.6 61	09.4 59	09.8 60	09.8 64	09.6 68	09.3 70
7	RA DEC 00 56 60 39	06.3 69	05.2 67	04.5 62	04.4 54	04.9 47	06.2 44	07.8 45	09.5 51	10.8 60	11.5 70	11.7 79	11.3 86	10.5 90
8	RA DEC 01 25 60 11	10.1 25	09.1 24	08.3 19	08.0 11	08.4 05	09.6 01	11.2 01	12.9 05	14.3 13	15.2 23	15.5 32	15.3 39	14.7 44
9	RA DEC 01 37 57 16	22.4 85	21.4 85	20.6 80	20.1 71	20.2 60	21.0 49	22.2 41	23.6 37	24.9 39	25.7 45	25.9 54	25.4 62	24.6 67
10 SEE TABLE 11. APPARENT PLACES OF POLARIS, 1990														
11	RA DEC 02 06 23 25	37.7 09	37.3 08	36.9 05	36.7 03	36.8 01	37.4 02	38.3 05	39.4 10	40.4 16	41.1 21	41.4 24	41.5 26	41.4 26
12	RA DEC 02 57 40 20	54.8 44	54.1 48	53.5 47	52.9 41	52.8 33	53.1 23	53.8 14	54.9 08	56.0 05	56.8 08	57.3 15	57.4 24	57.1 31
13	RA DEC 03 01 04 03	46.9 11	46.5 09	46.1 08	45.8 08	45.8 09	46.2 13	46.9 18	47.9 23	48.8 27	49.6 29	50.0 28	50.3 26	50.3 24
14	RA DEC 03 23 49 49	38.4 53	37.8 55	37.1 54	36.5 50	36.4 45	36.9 40	37.9 38	39.3 38	40.7 42	41.9 47	42.7 54	43.2 60	43.2 65
15	RA DEC 04 35 16 29	22.8 32	22.6 31	22.2 31	21.7 30	21.5 29	21.6 30	22.1 32	23.0 34	24.0 37	24.9 39	25.7 39	26.2 38	26.5 38
16	RA DEC 05 14 08 12	05.4 41	05.3 45	04.9 48	04.3 48	04.0 45	04.0 41	04.3 35	05.0 30	05.9 26	06.8 26	07.6 28	08.2 34	08.5 39
17	RA DEC 05 15 45 59	59.8 31	59.6 34	59.1 36	58.3 35	57.9 31	57.9 27	58.4 23	59.5 21	60.8 20	62.0 21	63.2 24	64.1 28	64.6 32
18	RA DEC 05 24 06 20	37.7 35	37.6 32	37.3 31	36.8 30	36.4 31	36.4 33	36.8 36	37.5 40	38.4 42	39.3 43	40.1 42	40.8 39	41.2 35
19	RA DEC 05 25 28 36	41.9 08	41.8 09	41.4 09	40.9 08	40.5 07	40.5 06	40.9 05	41.8 04	42.8 05	43.8 06	44.8 07	45.5 07	46.0 08
20	RA DEC 05 35 01 12	44.4 23	44.3 26	43.9 28	43.4 29	43.1 27	43.0 24	43.4 20	44.0 15	44.9 12	45.8 12	46.6 14	47.3 18	47.7 23
21	RA DEC 05 40 01 56	17.3 46	17.2 50	16.8 52	16.3 52	16.0 51	15.9 47	16.2 43	16.9 39	17.7 36	18.6 35	19.4 37	20.1 42	20.5 47
22	RA DEC 05 54 07 24	40.0 26	39.9 24	39.6 23	39.1 22	38.7 23	38.7 25	39.0 27	39.6 30	40.5 32	41.4 33	42.2 31	43.0 28	43.4 24
23	RA DEC 06 23 52 41	46.4 20	46.1 30	45.3 36	44.3 38	43.3 35	42.7 28	42.6 19	43.1 09	44.1 02	45.3 00	46.5 04	47.4 13	47.8 24
24	RA DEC 06 37 16 24	10.4 34	10.5 33	10.2 33	09.7 33	09.3 33	09.1 34	09.3 34	09.9 35	10.7 36	11.6 35	12.6 33	13.4 31	14.1 29
25	RA DEC 06 44 16 41	44.5 63	44.6 70	44.3 74	43.7 76	43.2 74	43.0 70	43.1 65	43.5 59	44.3 54	45.1 53	46.0 56	46.8 63	47.4 71

Table 10a (3). Apparent Places of Stars, 1990 (Degrees)—Continued

Star No.	Right ascen- sion Declina- tion (°')	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH													
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	
		Seconds (time of RA or arc of declination)													
26	RA DEC	06 58 -28 57	16.0 24	16.1 33	15.8 38	15.1 41	14.6 40	14.2 35	14.2 28	14.6 20	15.3 14	16.2 12	17.2 15	18.0 23	18.6 32
27	RA DEC	07 07 -26 22	61.1 32	61.2 41	60.9 46	60.3 49	59.8 48	59.4 43	59.4 36	59.8 29	60.5 24	61.3 22	62.3 25	63.1 32	63.8 41
28	RA DEC	07 33 31 54	60.3 40	60.7 41	60.5 43	60.0 45	59.5 45	59.2 44	59.2 42	59.7 40	60.4 37	61.4 34	62.5 31	63.5 29	64.4 29
29	RA DEC	07 38 05 14	48.8 66	49.1 62	49.0 60	48.6 60	48.1 60	47.8 62	47.9 64	48.2 66	48.8 67	49.6 66	50.5 64	51.4 59	52.2 54
30	RA DEC	07 44 28 02	44.8 63	45.1 64	45.0 65	44.6 67	44.1 67	43.7 67	43.7 65	44.1 63	44.8 61	45.7 58	46.8 55	47.8 52	48.7 51
31	RA DEC	08 09 -47 18	15.6 17	15.8 28	15.5 37	14.8 43	14.0 44	13.2 40	12.9 34	13.0 25	13.5 17	14.4 13	15.6 13	16.8 20	17.6 31
32	RA DEC	08 22 -59 28	20.9 28	21.2 40	20.8 49	19.8 57	18.6 59	17.5 56	16.8 50	16.7 41	17.3 32	18.4 26	19.9 26	21.3 32	22.4 43
33	RA DEC	09 07 -43 23	39.4 22	39.9 33	39.9 42	39.5 50	38.8 53	38.1 51	37.7 46	37.6 39	37.9 31	38.6 26	39.7 25	40.9 30	41.9 40
34	RA DEC	09 13 -69 40	08.2 21	08.9 33	08.6 44	07.4 53	05.7 58	03.9 58	02.6 53	01.9 45	02.2 36	03.4 28	05.3 26	07.5 29	09.2 39
35	RA DEC	09 27 -08 36	07.4 53	08.0 60	08.2 65	08.0 67	07.6 68	07.2 66	07.0 64	07.0 60	07.3 57	07.9 56	08.7 59	09.6 64	10.6 71
36	RA DEC	10 07 12 00	52.1 53	52.8 49	53.1 48	53.0 48	52.7 50	52.4 51	52.1 53	52.1 53	52.3 52	52.7 49	53.5 45	54.4 39	55.5 33
37	RA DEC	11 01 56 25	17.1 51	18.4 52	19.0 58	19.0 65	18.5 71	17.6 74	16.9 73	16.4 68	16.3 59	16.7 50	17.7 40	19.0 33	20.7 29
38	RA DEC	11 03 61 47	09.8 58	11.3 60	12.1 66	12.0 74	11.4 80	10.3 83	09.4 82	08.7 76	08.6 67	09.0 57	10.1 47	11.6 40	13.5 36
39	RA DEC	11 48 14 37	34.2 30	35.1 25	35.7 24	35.9 25	35.8 27	35.5 30	35.2 32	34.9 32	34.8 31	35.0 27	35.5 22	36.3 15	37.4 08
40	RA DEC	11 53 53 44	20.2 39	21.6 39	22.4 43	22.7 50	22.4 57	21.7 62	21.0 63	20.3 59	20.0 52	20.1 43	20.7 33	21.9 24	23.4 18
41	RA DEC	12 15 -17 29	18.2 12	19.2 19	19.8 25	20.1 30	20.1 32	19.9 33	19.6 32	19.3 29	19.1 26	19.2 24	19.6 24	20.4 27	21.5 33
42	RA DEC	12 26 -63 02	02.4 25	04.1 32	05.2 42	05.8 53	05.7 62	05.0 68	04.1 70	03.1 68	02.3 62	02.2 54	02.9 47	04.4 43	06.3 46
43	RA DEC	12 30 -57 03	36.6 15	38.1 23	39.1 32	39.7 42	39.6 51	39.1 57	38.4 59	37.6 56	37.1 50	36.9 43	37.5 36	38.8 34	40.5 36
44	RA DEC	12 47 -59 37	08.0 52	09.6 58	10.7 67	11.4 78	11.4 87	11.0 93	10.2 96	09.3 94	08.6 88	08.4 81	09.0 74	10.2 70	12.0 72
45	RA DEC	12 53 56 00	36.5 26	38.0 24	39.1 27	39.6 34	39.6 42	39.0 49	38.2 52	37.4 50	36.7 44	36.5 35	36.8 24	37.7 14	39.1 06
46	RA DEC	13 23 54 57	32.1 75	33.6 71	34.7 73	35.4 80	35.5 88	35.0 95	34.3 99	33.4 99	32.7 94	32.3 85	32.4 75	33.1 64	34.5 55
47	RA DEC	13 24 -11 06	40.3 38	41.3 44	42.1 49	42.6 52	42.8 54	42.8 54	42.6 52	42.3 51	42.0 49	41.8 48	42.0 48	42.7 51	43.7 57
48	RA DEC	13 47 49 21	09.2 24	10.5 19	11.6 20	12.3 26	12.5 34	12.2 41	11.7 46	10.9 47	10.2 43	09.8 36	09.8 26	10.4 15	11.6 06
49	RA DEC	14 03 -60 19	06.1 22	07.9 25	09.4 32	10.5 41	11.1 50	11.0 57	10.5 62	09.7 63	08.7 59	08.2 53	08.3 46	09.2 40	10.9 39

Table 10a (3). Apparent Places of Stars, 1990 (Degrees)—Continued

Star No.	Right Ascension Declination (° ')	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH													
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	
		Seconds (time of RA or arc of declination)													
50	RA DEC	14 06 -36 19	05.4 13	06.6 18	07.6 24	08.4 31	08.8 36	08.9 40	08.6 42	08.2 42	07.7 39	07.4 35	07.5 31	08.2 29	09.3 31
51	RA DEC	14 15 19 13	12.5 48	13.5 42	14.4 40	15.0 41	15.3 45	15.4 50	15.1 54	14.8 56	14.3 55	14.0 52	14.0 46	14.5 38	15.4 30
52	RA DEC	14 38 -60 47	54.1 33	55.9 35	57.5 40	58.8 48	59.6 57	59.7 64	59.3 70	58.4 71	57.4 69	56.6 64	56.5 56	57.2 50	58.8 47
53	RA DEC	14 50 -16 00	19.3 07	20.4 12	21.3 16	22.1 19	22.6 21	22.8 21	22.7 21	22.4 19	22.0 18	21.7 17	21.6 16	22.0 17	22.9 21
54	RA DEC	14 50 74 11	41.9 22	44.4 17	46.8 17	48.7 24	49.4 33	48.8 42	47.2 48	45.0 51	42.6 48	40.7 40	39.6 30	39.8 18	41.3 08
55	RA DEC	15 34 26 44	15.5 37	16.5 30	17.4 27	18.3 29	18.8 34	19.1 41	19.0 47	18.6 51	18.1 52	17.6 49	17.3 43	17.5 35	18.2 26
56	RA DEC	15 59 -22 35	44.1 42	45.1 45	46.0 48	47.0 50	47.7 52	48.1 53	48.2 54	48.0 53	47.6 52	47.1 51	46.9 50	47.1 49	47.9 50
57	RA DEC	16 28 -26 24	47.1 42	48.0 43	49.0 46	50.1 48	50.9 50	51.4 51	51.6 52	51.5 52	51.0 52	50.5 51	50.2 49	50.4 48	51.0 48
58	RA DEC	16 47 -69 00	33.8 37	35.9 32	38.1 32	40.5 34	42.5 40	43.7 48	44.0 55	43.5 61	42.2 64	40.7 62	39.6 56	39.6 48	40.8 41
59	RA DEC	17 09 -15 42	47.6 52	48.4 55	49.3 57	50.3 58	51.1 57	51.8 56	52.1 55	52.0 54	51.6 53	51.1 53	50.8 53	50.8 53	51.3 55
60	RA DEC	17 32 -37 05	55.0 55	55.9 53	57.0 53	58.2 53	59.2 55	60.0 57	60.5 59	60.5 61	60.1 63	59.5 63	58.9 61	58.9 57	59.4 55
61	RA DEC	17 34 12 33	27.5 51	28.2 45	29.0 41	30.0 41	30.8 44	31.4 50	31.7 56	31.6 61	31.2 64	30.7 64	30.2 62	30.1 57	30.5 51
62	RA DEC	17 56 51 28	20.6 73	21.3 63	22.3 58	23.5 57	24.6 62	25.4 71	25.6 81	25.3 90	24.5 96	23.5 97	22.5 93	22.0 86	22.1 75
63	RA DEC	18 23 -34 23	29.8 31	30.6 29	31.5 27	32.6 26	33.7 26	34.7 26	35.2 28	35.4 30	35.1 31	34.6 32	34.0 31	33.8 29	34.1 26
64	RA DEC	18 36 38 46	34.7 19	35.1 10	35.9 04	37.0 03	38.0 07	38.8 15	39.2 24	39.2 33	38.7 40	38.0 42	37.3 40	36.8 34	36.9 26
65	RA DEC	18 54 -26 18	38.1 43	38.7 41	39.5 40	40.5 38	41.6 37	42.5 35	43.1 35	43.4 35	43.2 36	42.7 37	42.1 37	41.9 36	42.1 35
66	RA DEC	19 50 08 50	17.1 25	17.4 20	17.9 17	18.7 17	19.7 20	20.6 26	21.2 32	21.5 38	21.5 43	21.1 45	20.6 44	20.2 42	20.2 38
67	RA DEC	20 24 -56 45	51.0 75	51.3 68	52.1 61	53.4 54	55.0 50	56.6 49	57.8 51	58.5 56	58.5 61	57.9 66	56.9 68	56.1 66	55.9 61
68	RA DEC	20 41 45 14	04.0 44	04.0 35	04.4 28	05.3 23	06.4 24	07.5 30	08.4 39	08.9 49	08.8 59	08.2 66	07.4 68	06.7 66	06.3 60
69	RA DEC	21 40 -77 25	22.4 81	21.7 71	22.5 61	24.6 51	27.6 44	31.2 41	34.3 43	36.4 48	37.1 56	36.0 64	33.5 69	30.8 69	28.8 62
★70	RA DEC	21 43 09 49	41.3 45	41.3 41	41.5 39	42.1 38	42.9 40	43.9 46	44.8 52	45.4 59	45.7 65	45.5 68	45.1 68	44.7 67	44.5 65
★71	RA DEC	22 07 -47 00	36.5 47	36.3 42	36.5 35	37.2 27	38.3 19	39.6 14	40.8 12	41.7 13	42.2 17	42.1 23	41.5 28	40.8 29	40.3 27
72	RA DEC	22 57 -29 40	06.4 39	06.1 37	06.2 33	06.6 27	07.3 20	08.3 13	09.4 08	10.3 06	10.8 07	10.9 10	10.6 15	10.2 18	09.8 18
73	RA DEC	23 04 15 09	15.8 11	15.5 08	15.5 04	15.9 03	16.6 04	17.5 08	18.5 15	19.3 22	19.8 28	19.9 33	19.7 35	19.3 35	19.0 33

Table 10a (4). Apparent Places of Stars, 1991 (Degrees)

Star No.	Right ascen- sion Declina- tion (°')	(Hr Min)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
1	RA DEC	00 07 29 02	55.9 42	55.5 38	55.3 34	55.4 29	55.9 28	56.8 30	57.9 35	58.9 42	59.6 50	59.9 56	59.9 61	59.6 63	59.2 62
2	RA DEC	00 08 59 05	41.9 84	40.9 80	40.4 73	40.5 65	41.3 59	42.7 57	44.3 60	45.7 68	46.7 78	47.2 88	47.0 97	46.4 103	45.5 104
3	RA DEC	00 25 77 17	19.1 92	16.6 87	15.1 78	14.6 67	15.5 55	17.8 46	20.8 41	24.0 41	26.3 47	27.2 55	26.4 64	24.3 70	21.5 71
4	RA DEC	00 25 42 20	51.5 86	51.0 84	50.7 79	50.6 71	51.1 62	52.0 53	53.1 46	54.2 44	55.1 46	55.5 51	55.4 58	55.0 63	54.4 66
5	RA DEC	00 39 56 29	60.3 40	59.4 38	58.8 32	58.7 24	59.3 18	60.6 16	62.0 18	63.5 24	64.6 33	65.2 43	65.3 52	64.8 58	64.1 60
6	RA DEC	00 43 18 01	09.3 70	09.0 71	08.7 69	08.7 65	09.1 59	09.8 52	10.8 45	11.7 40	12.5 39	12.9 40	13.0 43	12.7 47	12.4 50
7	RA DEC	00 56 60 40	10.5 30	09.5 28	08.7 22	08.5 14	09.1 07	10.4 04	12.0 05	13.6 11	15.0 19	15.7 29	15.9 39	15.4 46	14.6 49
8	RA DEC	01 25 60 11	14.7 44	13.7 43	12.9 38	12.5 30	12.9 23	14.1 19	15.6 19	17.3 24	18.7 32	19.7 41	20.0 51	19.8 58	19.1 62
9	RA DEC	01 37 57 16	24.6 67	23.6 66	22.8 61	22.3 52	22.3 42	23.1 31	24.3 23	25.7 19	27.0 21	27.8 27	28.0 36	27.5 44	26.7 49
10	SEE TABLE 11. APPARENT PLACES OF POLARIS, 1991														
11	RA DEC	02 06 23 25	41.4 26	41.0 25	40.6 22	40.3 19	40.5 18	41.1 19	42.0 22	43.0 27	44.0 32	44.7 37	45.1 40	45.2 42	45.0 42
12	RA DEC	02 57 40 19	57.1 91	56.5 94	55.8 93	55.2 88	55.1 80	55.4 70	56.1 61	57.2 54	58.2 52	59.1 55	59.6 62	59.7 71	59.3 78
13	RA DEC	03 01 04 03	50.3 24	49.9 22	49.5 21	49.2 21	49.1 22	49.5 26	50.3 31	51.2 36	52.1 40	52.8 42	53.4 41	53.6 39	53.5 37
14	RA DEC	03 23 49 49	43.2 65	42.6 67	41.9 66	41.2 61	41.1 56	41.6 51	42.6 49	43.9 50	45.3 53	46.5 58	47.4 65	47.8 71	47.8 76
15	RA DEC	04 35 16 29	26.5 38	26.3 37	25.9 36	25.4 35	25.1 34	25.3 35	25.8 37	26.6 40	27.6 42	28.5 43	29.3 44	29.9 43	30.1 42
16	RA DEC	05 14 08 12	08.5 39	08.4 43	08.0 46	07.4 46	07.0 44	07.0 39	07.4 34	08.1 28	08.9 25	09.8 24	10.6 27	11.2 32	11.5 38
17	RA DEC	05 16 45 59	04.6 32	04.4 36	03.9 37	03.1 36	02.6 33	02.6 28	03.2 24	04.2 22	05.4 21	06.7 22	07.9 25	08.8 28	09.2 33
18	RA DEC	05 24 06 20	41.2 35	41.1 33	40.7 32	40.2 31	39.8 32	39.8 34	40.2 37	40.9 40	41.8 43	42.7 43	43.5 42	44.2 39	44.5 36
19	RA DEC	05 25 28 36	46.0 08	45.9 09	45.5 10	44.9 09	44.5 07	44.6 06	45.0 05	45.8 05	46.8 05	47.8 06	48.8 07	49.5 07	49.9 08
20	RA DEC	05 35 01 12	47.7 23	47.6 26	47.2 28	46.7 29	46.3 27	46.3 24	46.6 20	47.2 16	48.1 13	49.0 12	49.8 14	50.5 19	50.8 24
21	RA DEC	05 40 01 56	20.5 47	20.5 50	20.1 52	19.5 53	19.2 51	19.1 48	19.4 44	20.0 39	20.9 36	21.8 36	22.6 38	23.3 42	23.6 48
22	RA DEC	05 54 07 24	43.4 24	43.5 22	43.1 21	42.6 20	42.2 21	42.1 23	42.4 25	43.0 28	43.9 30	44.8 30	45.7 29	46.4 26	46.8 22
23	RA DEC	06 23 52 41	47.8 24	47.6 34	46.8 40	45.7 42	44.7 40	44.1 33	44.1 24	44.5 14	45.5 07	46.7 05	47.9 09	48.8 18	49.2 29
24	RA DEC	06 37 16 24	14.1 29	14.2 28	13.9 27	13.4 27	13.0 27	12.8 28	13.0 28	13.5 29	14.3 29	15.2 29	16.2 27	17.0 25	17.6 22
25	RA DEC	06 44 16 42	47.4 11	47.4 18	47.1 22	46.6 23	46.0 22	45.8 18	45.9 13	46.3 07	47.0 02	47.9 01	48.8 04	49.6 11	50.1 19

Table 10a (4). Apparent Places of Stars, 1991 (Degrees)—Continued

Star No.	Right ascen- sion Declination (°')	(Hr Min)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
26	RA DEC	06 58 -28 57	18.6 32	18.7 41	18.3 46	17.7 49	17.1 47	16.7 43	16.7 36	17.1 28	17.8 22	18.7 21	19.7 23	20.5 30	21.1 40
27	RA DEC	07 08 -26 22	03.8 41	03.9 49	03.6 55	03.0 57	02.4 56	02.0 52	02.0 45	02.4 38	03.0 33	03.9 31	04.9 33	05.7 40	06.3 50
28	RA DEC	07 34 -31 54	04.4 29	04.8 30	04.6 32	04.1 34	03.5 34	03.2 33	03.3 31	03.7 29	04.4 26	05.3 23	06.5 20	07.5 18	08.3 18
29	RA DEC	07 38 -05 14	52.2 54	52.5 50	52.4 48	51.9 48	51.4 48	51.2 49	51.2 51	51.5 54	52.1 55	52.9 54	53.8 51	54.7 47	55.4 42
30	RA DEC	07 44 -28 02	48.7 51	49.1 52	48.9 53	48.4 55	47.9 56	47.6 55	47.6 54	47.9 52	48.6 49	49.5 46	50.6 43	51.6 41	52.4 39
31	RA DEC	08 09 -47 18	17.6 31	17.9 42	17.6 50	16.9 56	16.0 57	15.3 54	15.0 47	15.0 39	15.5 31	16.5 26	17.7 27	18.8 33	19.7 44
32	RA DEC	08 22 -59 28	22.4 43	22.7 54	22.3 64	21.3 71	20.1 73	19.0 71	18.3 64	18.2 55	18.8 46	19.8 41	21.3 41	22.8 46	23.9 57
33	RA DEC	09 07 -43 23	41.9 40	42.4 51	42.4 60	41.9 67	41.2 70	40.6 69	40.2 64	40.0 56	40.3 48	41.1 43	42.1 42	43.3 47	44.3 57
34	RA DEC	09 13 -69 40	09.2 39	09.9 50	09.6 61	08.4 70	06.7 75	05.0 75	03.6 71	03.0 62	03.2 53	04.4 46	06.4 43	08.5 47	10.2 56
35	RA DEC	09 27 -08 37	10.6 11	11.2 18	11.4 23	11.1 26	10.7 26	10.4 25	10.1 22	10.1 18	10.4 15	11.0 15	11.8 17	12.8 22	13.7 29
36	RA DEC	10 07 -12 00	55.5 33	56.3 29	56.5 28	56.4 28	56.1 30	55.7 31	55.5 32	55.4 33	55.6 32	56.0 29	56.8 25	57.7 19	58.8 13
37	RA DEC	11 01 -56 25	20.7 29	22.0 31	22.6 36	22.6 44	22.0 50	21.2 53	20.4 52	19.9 47	19.8 39	20.2 29	21.2 19	22.5 12	24.1 08
38	RA DEC	11 03 -61 47	13.5 36	15.0 38	15.7 44	15.6 52	14.9 59	13.9 62	13.0 60	12.3 55	12.1 46	12.5 36	13.6 26	15.1 19	16.9 15
39	RA DEC	11 48 -14 36	37.4 68	38.3 63	38.9 62	39.1 63	39.0 66	38.7 68	38.4 70	38.1 71	38.0 70	38.1 66	38.6 61	39.5 54	40.5 47
40	RA DEC	11 53 -53 43	23.4 78	24.8 78	25.6 82	25.8 89	25.4 96	24.8 101	24.1 102	23.4 98	23.0 91	23.1 82	23.8 72	24.9 63	26.3 57
41	RA DEC	12 15 -17 29	21.5 33	22.5 40	23.1 46	23.4 51	23.4 53	23.2 54	22.9 53	22.6 50	22.4 47	22.5 45	22.9 45	23.7 47	24.8 53
42	RA DEC	12 26 -63 02	06.3 46	08.1 53	09.2 63	09.7 73	09.6 83	09.0 89	08.0 91	07.0 89	06.2 82	06.1 74	06.8 67	08.2 64	10.2 66
43	RA DEC	12 30 -57 03	40.5 36	42.0 44	43.0 53	43.5 63	43.4 72	43.0 78	42.3 80	41.4 77	40.8 71	40.8 63	41.3 57	42.6 54	44.2 57
44	RA DEC	12 47 -59 38	12.0 12	13.7 19	14.8 28	15.4 38	15.5 47	15.0 54	14.3 56	13.4 54	12.6 48	12.5 41	13.0 34	14.2 30	16.0 32
45	RA DEC	12 53 -55 59	39.1 66	40.6 64	41.7 67	42.2 74	42.1 82	41.5 89	40.8 92	39.9 90	39.2 84	39.0 75	39.3 64	40.1 54	41.5 47
46	RA DEC	13 23 -54 57	34.5 55	36.0 52	37.1 54	37.7 61	37.8 69	37.3 77	36.6 80	35.7 80	35.0 75	34.6 67	34.7 56	35.4 45	36.7 37
47	RA DEC	13 24 -11 06	43.7 57	44.8 63	45.5 68	46.0 71	46.2 73	46.2 72	46.0 71	45.6 69	45.3 67	45.2 66	45.4 67	46.0 70	47.0 75
48	RA DEC	13 47 -49 20	11.6 66	12.9 61	14.0 62	14.6 68	14.8 76	14.6 84	14.0 88	13.2 89	12.5 86	12.1 78	12.1 68	12.7 58	13.8 49
49	RA DEC	14 03 -60 19	10.9 39	12.7 43	14.2 49	15.3 58	15.8 67	15.8 74	15.3 79	14.4 80	13.5 76	12.9 70	13.0 62	14.0 57	15.6 55

Table 10a.(4). Apparent Places of Stars, 1991 (Degrees)—Continued

Star No.	Right ascen- sion Decli- nation (^o)	(Hr Min)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
50	RA DEC	14 06 36 19	09.3 31	10.6 36	11.5 42	12.2 48	12.6 53	12.7 58	12.5 60	12.1 59	11.6 56	11.3 52	11.4 48	12.0 46	13.1 48
51	RA DEC	14 15 19 13	15.4 30	16.4 23	17.3 21	17.9 22	18.2 27	18.2 31	18.0 35	17.6 38	17.1 37	16.8 34	16.9 28	17.3 20	18.1 12
52	RA DEC	14 38 60 47	58.8 47	60.6 49	62.1 54	63.4 62	64.1 70	64.3 78	63.9 84	63.0 85	62.0 83	61.2 77	61.1 70	61.8 64	63.3 61
53	RA DEC	14 50 16 00	22.9 21	24.0 26	24.9 30	25.6 33	26.1 35	26.3 35	26.3 35	25.9 33	25.5 32	25.2 30	25.2 30	25.6 31	26.4 34
54	RA DEC	14 50 74 10	41.3 68	43.8 63	46.2 63	48.1 70	48.8 79	48.2 88	46.7 95	44.4 97	42.0 94	40.0 87	39.0 76	39.2 65	40.7 55
55	RA DEC	15 34 26 44	18.2 26	19.2 19	20.1 16	20.9 18	21.5 23	21.7 30	21.6 36	21.2 40	20.7 41	20.2 39	19.9 33	20.1 25	20.7 16
56	RA DEC	15 59 22 35	47.9 50	48.9 53	49.9 56	50.8 59	51.5 60	51.9 61	52.1 62	51.8 62	51.4 61	50.9 59	50.7 58	50.9 57	51.6 58
57	RA DEC	16 28 26 24	51.0 48	52.0 50	53.0 52	54.0 54	54.8 55	55.4 57	55.6 58	55.4 58	54.9 58	54.4 56	54.1 54	54.3 53	54.9 53
58	RA DEC	16 47 69 00	40.8 41	42.9 37	45.1 36	47.4 39	49.3 44	50.6 52	51.0 59	50.4 65	49.0 68	47.6 66	46.5 60	46.4 52	47.5 45
59	RA DEC	17 09 15 42	51.3 55	52.1 57	53.0 59	54.0 60	54.8 59	55.4 58	55.7 57	55.6 56	55.3 55	54.8 55	54.4 54	54.4 55	54.9 56
60	RA DEC	17 32 37 05	59.4 55	60.3 53	61.4 53	62.5 54	63.5 55	64.4 57	64.8 59	64.8 61	64.3 63	63.8 62	63.3 60	63.2 57	63.6 54
61	RA DEC	17 34 12 33	30.5 51	31.2 44	32.0 41	32.9 41	33.7 44	34.3 50	34.6 56	34.6 61	34.2 64	33.6 65	33.2 62	33.1 58	33.4 51
62	RA DEC	17 56 51 28	22.1 75	22.7 65	23.7 60	25.0 59	26.1 64	26.9 73	27.1 83	26.8 92	26.0 98	25.0 99	24.0 96	23.4 88	23.5 78
63	RA DEC	18 23 34 23	34.1 26	34.9 24	35.8 23	36.9 22	37.9 21	38.9 22	39.5 23	39.6 25	39.3 27	38.7 27	38.2 26	37.9 24	38.2 22
64	RA DEC	18 36 38 46	36.9 26	37.4 16	38.1 11	39.1 09	40.1 13	41.0 21	41.4 31	41.4 40	40.9 46	40.2 49	39.4 47	39.0 41	39.0 32
65	RA DEC	18 54 26 18	42.1 35	42.7 34	43.5 33	44.5 31	45.5 29	46.4 28	47.0 27	47.3 28	47.0 29	46.6 29	46.0 30	45.8 29	45.9 27
66	RA DEC	19 50 08 50	20.2 38	20.5 33	21.1 30	21.9 29	22.8 32	23.7 38	24.3 45	24.6 51	24.6 55	24.2 57	23.7 57	23.3 55	23.2 50
67	RA DEC	20 24 56 45	55.9 61	56.2 53	57.0 46	58.3 40	59.8 35	61.4 34	62.7 36	63.4 41	63.3 47	62.7 52	61.8 54	60.9 52	60.6 46
68	RA DEC	20 41 45 14	06.3 60	06.3 51	06.7 44	07.5 39	08.7 40	09.8 45	10.7 54	11.1 65	11.0 75	10.5 81	09.7 84	09.0 82	08.5 76
69	RA DEC	21 40 77 25	28.8 62	28.2 53	28.9 43	30.9 33	33.8 25	37.4 22	40.5 24	42.7 30	43.2 38	42.1 46	39.7 50	37.0 50	34.9 44
★ 70	RA DEC	21 43 09 49	44.5 65	44.5 61	44.7 58	45.2 57	46.0 59	47.0 65	47.9 71	48.5 78	48.8 83	48.6 87	48.3 88	47.8 86	47.6 83
★ 71	RA DEC	22 07 46 59	40.3 87	40.2 82	40.4 75	41.1 67	42.1 60	43.4 54	44.6 52	45.5 53	46.0 58	45.8 63	45.3 68	44.6 70	44.1 68
72	RA DEC	22 57 29 39	09.8 78	09.6 76	09.6 72	10.0 66	10.7 59	11.7 52	12.8 47	13.7 45	14.2 46	14.3 50	14.0 54	13.5 57	13.1 57
73	RA DEC	23 04 15 09	19.0 33	18.8 29	18.8 26	19.1 24	19.8 25	20.7 29	21.7 36	22.5 43	23.0 49	23.1 54	22.9 56	22.5 56	22.2 54

Table 10a.(5). Apparent Places of Stars, 1992 (Degrees)

Star No.	Right Ascension Declination (° ')	(Hr Min)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
1	RA DEC	00 07 29 02	59.2 62	58.8 59	58.6 54	58.7 50	59.2 48	60.2 50	61.2 55	62.2 62	62.9 70	63.2 76	63.1 81	62.9 83	62.4 82
2	RA DEC	00 08 59 06	45.5 44	44.6 41	44.1 34	44.1 25	44.9 19	46.3 18	47.9 21	49.4 28	50.4 38	50.8 48	50.6 57	50.0 63	49.1 64
3	RA DEC	00 25 77 17	21.5 71	18.9 66	17.4 57	17.0 46	17.9 35	20.1 25	23.1 20	26.3 21	28.6 26	29.4 35	28.6 44	26.5 50	23.6 51
4	RA DEC	00 25 42 20	54.4 66	53.9 64	53.5 59	53.5 51	54.0 42	54.8 33	56.0 27	57.1 24	57.9 26	58.3 32	58.2 38	57.8 44	57.2 47
5	RA DEC	00 40 56 29	04.1 60	03.3 58	02.7 52	02.6 44	03.1 38	04.4 35	05.9 37	07.3 44	08.4 53	09.0 62	09.0 72	08.6 78	07.8 80
6	RA DEC	00 43 18 01	12.4 50	12.0 51	11.8 49	11.8 45	12.1 40	12.8 32	13.8 25	14.8 21	15.5 19	15.9 21	15.9 24	15.7 28	15.3 31
7	RA DEC	00 56 60 40	14.6 49	13.6 47	12.9 41	12.6 33	13.2 26	14.5 23	16.1 24	17.8 30	19.0 39	19.8 48	19.9 58	19.5 65	18.6 68
8	RA DEC	01 25 60 11	19.1 62	18.1 61	17.3 56	16.9 48	17.3 41	18.5 37	20.1 37	21.7 42	23.1 50	24.0 59	24.4 68	24.1 76	23.3 79
9	RA DEC	01 37 57 16	26.7 49	25.6 48	24.8 43	24.3 34	24.4 24	25.1 13	26.3 06	27.7 02	29.0 04	29.8 10	29.9 19	29.5 27	28.6 32
10	SEE TABLE 11. APPARENT PLACES OF POLARIS, 1992														
11	RA DEC	02 06 23 25	45.0 42	44.6 41	44.2 38	43.9 35	44.0 34	44.6 34	45.6 37	46.6 42	47.5 48	48.2 52	48.6 56	48.7 58	48.4 58
12	RA DEC	02 57 40 19	59.3 78	58.7 81	58.1 80	57.5 75	57.3 67	57.6 57	58.4 48	59.4 42	60.5 40	61.3 43	61.8 50	61.8 59	61.5 66
13	RA DEC	03 01 04 03	53.5 37	53.2 34	52.8 33	52.4 33	52.4 35	52.8 38	53.5 43	54.4 48	55.3 52	56.0 53	56.6 53	56.8 51	56.7 48
14	RA DEC	03 23 49 49	47.8 76	47.2 78	46.5 77	45.8 72	45.7 67	46.2 62	47.2 59	48.5 60	49.9 64	51.0 69	51.9 75	52.3 81	52.2 86
15	RA DEC	04 35 16 29	30.1 42	29.9 41	29.5 40	28.9 40	28.7 39	28.8 39	29.4 41	30.2 44	31.2 46	32.1 48	32.9 48	33.4 48	33.6 46
16	RA DEC	05 14 08 12	11.5 38	11.4 42	10.9 44	10.4 44	10.0 42	10.0 38	10.4 33	11.0 27	11.9 24	12.7 23	13.6 26	14.1 31	14.4 37
17	RA DEC	05 16 45 59	09.2 33	09.1 36	08.5 38	07.7 37	07.2 33	07.2 28	07.8 25	08.8 22	10.0 22	11.3 23	12.5 25	13.3 29	13.7 33
18	RA DEC	05 24 06 20	44.5 36	44.4 33	44.1 32	43.5 32	43.1 32	43.1 34	43.5 37	44.2 41	45.1 43	46.0 44	46.8 42	47.4 39	47.7 36
19	RA DEC	05 25 28 36	49.9 08	49.9 09	49.5 10	48.8 09	48.4 07	48.4 06	48.9 05	49.7 05	50.7 05	51.7 06	52.7 06	53.4 07	53.8 08
20	RA DEC	05 35 01 12	50.8 24	50.8 27	50.4 29	49.8 29	49.4 28	49.4 25	49.7 21	50.4 17	51.2 14	52.1 13	52.9 16	53.5 20	53.9 24
21	RA DEC	05 40 01 56	23.6 48	23.6 51	23.2 53	22.7 54	22.3 52	22.2 49	22.5 45	23.2 41	24.0 38	24.9 37	25.7 40	26.4 44	26.7 49
22	RA DEC	05 54 07 24	46.8 22	46.8 20	46.5 18	45.9 18	45.5 19	45.4 20	45.7 23	46.4 26	47.2 28	48.1 28	49.0 26	49.7 23	50.1 20
23	RA DEC	06 23 52 41	49.2 29	49.0 40	48.2 46	47.1 47	46.1 45	45.5 38	45.4 29	45.9 19	46.9 12	48.1 11	49.3 15	50.2 23	50.6 35
24	RA DEC	06 37 16 24	17.6 22	17.8 21	17.5 21	17.0 21	16.5 21	16.3 21	16.5 22	17.1 23	17.9 23	18.8 22	19.7 21	20.6 18	21.1 16
25	RA DEC	06 44 16 42	50.1 19	50.2 26	49.9 30	49.3 31	48.8 30	48.5 26	48.6 21	49.1 15	49.7 10	50.6 09	51.5 13	52.3 19	52.8 27

Table 10a.(5). Apparent Places of Stars, 1992 (Degrees)—Continued

Star No.	Right ascen- sion Declina- tion (°')	(Hr Min)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
26	RA DEC	06 58 -28 57	21.1 40	21.1 49	20.8 54	20.1 57	19.5 55	19.1 51	19.2 44	19.6 36	20.2 30	21.1 29	22.1 32	22.9 39	23.5 48
27	RA DEC	07 08 -26 22	06.3 50	06.4 58	06.1 64	05.5 66	04.9 65	04.5 61	04.5 54	04.9 47	05.6 41	06.4 40	07.4 43	08.2 49	08.8 58
28	RA DEC	07 34 -31 54	08.3 18	08.7 19	08.5 21	08.0 23	07.4 23	07.1 22	07.1 20	07.5 18	08.3 15	09.2 12	10.3 09	11.3 07	12.1 07
29	RA DEC	07 38 -05 14	55.4 42	55.8 38	55.6 36	55.1 35	54.6 36	54.4 37	54.4 39	54.7 41	55.3 43	56.1 42	57.0 39	57.9 34	58.6 29
30	RA DEC	07 44 -28 02	52.4 39	52.8 40	52.7 42	52.2 43	51.6 44	51.3 43	51.3 42	51.7 40	52.3 37	53.2 34	54.3 31	55.3 29	56.1 28
31	RA DEC	08 09 -47 18	19.7 44	19.9 55	19.6 64	18.9 70	18.0 71	17.3 67	17.0 61	17.0 52	17.6 44	18.5 40	19.7 41	20.8 47	21.6 57
32	RA DEC	08 22 -59 28	23.9 57	24.2 69	23.7 79	22.7 85	21.5 88	20.4 85	19.8 79	19.7 69	20.2 60	21.3 55	22.8 55	24.3 61	25.3 71
33	RA DEC	09 07 -43 23	44.3 57	44.9 68	44.8 77	44.3 84	43.6 87	43.0 85	42.6 81	42.5 73	42.7 65	43.5 60	44.5 59	45.7 64	46.7 74
34	RA DEC	09 13 -69 40	10.2 56	11.0 68	10.7 79	09.4 88	07.7 92	06.0 92	04.7 88	04.0 79	04.3 70	05.5 63	07.5 60	09.6 64	11.7 71
35	RA DEC	09 27 -08 37	13.7 29	14.3 36	14.4 41	14.2 44	13.8 44	13.4 43	13.2 40	13.2 36	13.4 33	14.0 32	14.8 35	15.8 40	16.7 47
36	RA DEC	10 07 -11 59	58.8 73	59.5 69	59.8 68	59.7 69	59.3 70	58.9 72	58.7 73	58.6 73	58.8 73	59.2 70	60.0 65	61.0 60	61.9 54
37	RA DEC	11 01 -56 24	24.1 68	25.4 70	26.1 75	26.0 83	25.4 89	24.5 92	23.8 91	23.3 86	23.2 78	23.5 68	24.5 59	25.9 52	27.4 48
38	RA DEC	11 03 -61 46	16.9 75	18.4 77	19.2 84	19.1 92	18.3 98	17.3 101	16.3 100	15.7 94	15.5 85	15.9 75	16.9 65	18.5 58	20.3 55
39	RA DEC	11 48 -14 36	40.5 47	41.5 42	42.0 41	42.2 42	42.1 45	41.8 48	41.5 50	41.2 50	41.0 49	41.2 46	41.7 40	42.5 33	43.5 27
40	RA DEC	11 53 -53 43	26.3 57	27.7 57	28.6 61	28.8 68	28.4 76	27.7 80	27.0 81	26.3 78	26.0 71	26.0 61	26.7 51	27.8 42	29.3 37
41	RA DEC	12 15 -17 29	24.8 53	25.8 61	26.4 67	26.7 71	26.7 74	26.4 74	26.1 73	25.8 70	25.6 67	25.7 65	26.1 64	26.9 67	28.0 73
42	RA DEC	12 26 -63 03	10.2 06	11.9 14	13.1 23	13.6 34	13.4 43	12.8 49	11.8 51	10.8 49	10.0 42	09.9 34	10.7 27	12.1 24	14.0 26
43	RA DEC	12 30 -57 03	44.2 57	45.8 64	46.8 74	47.2 84	47.2 92	46.7 98	46.0 100	45.2 97	44.5 91	44.5 83	45.1 77	46.3 74	47.9 77
44	RA DEC	12 47 -59 38	16.0 32	17.7 39	18.8 48	19.4 58	19.4 67	19.0 73	18.2 76	17.3 74	16.6 68	16.4 60	16.9 53	18.2 50	19.9 51
45	RA DEC	12 53 -55 59	41.5 47	43.1 44	44.1 47	44.7 55	44.5 63	43.9 70	43.1 72	42.3 71	41.6 65	41.3 56	41.6 45	42.5 35	43.9 28
46	RA DEC	13 23 -54 57	36.7 37	38.2 34	39.3 36	40.0 43	40.0 51	39.5 59	38.8 62	37.9 62	37.1 57	36.7 49	36.8 38	37.6 27	38.9 19
47	RA DEC	13 24 -11 07	47.0 15	48.1 22	48.8 27	49.3 30	49.5 31	49.5 30	49.2 29	48.9 27	48.5 25	48.4 24	48.7 25	49.3 28	50.3 33
48	RA DEC	13 47 -49 20	13.8 49	15.1 44	16.2 45	16.9 51	17.0 59	16.7 67	16.2 72	15.4 72	14.7 69	14.3 61	14.3 51	14.9 41	16.0 32
49	RA DEC	14 03 -60 19	15.6 55	17.5 59	18.9 65	20.0 74	20.5 83	20.5 90	20.0 95	19.1 96	18.1 92	17.6 85	17.7 78	18.6 73	20.2 71

Table 10a.(5). Apparent Places of Stars, 1992 (Degrees)—Continued

Star No.	Right ascen- sion Declina- tion (°')	(Hr Min)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
50	RA DEC	14 06 -36 19	13.1 48	14.3 52	15.3 58	16.1 65	16.4 70	16.5 74	16.3 76	15.8 75	15.3 72	15.0 68	15.1 64	15.7 62	16.8 64
51	RA DEC	14 15 19 12	18.1 72	19.2 66	20.0 63	20.7 65	20.9 69	20.9 74	20.7 78	20.3 80	19.9 80	19.5 77	19.6 71	20.0 63	20.9 55
52	RA DEC	14 39 -60 48	03.3 01	05.1 03	06.7 08	08.0 16	08.7 24	08.8 31	08.4 37	07.5 39	06.4 36	05.7 30	05.6 23	06.3 17	07.7 14
53	RA DEC	14 50 -16 00	26.4 34	27.5 39	28.4 43	29.1 47	29.6 48	29.8 48	29.7 48	29.4 46	28.9 45	28.6 43	28.6 42	29.0 44	29.8 47
54	RA DEC	14 50 74 10	40.7 55	43.2 49	45.6 50	47.5 56	48.2 66	47.5 75	45.9 82	43.7 84	41.3 81	39.3 74	38.3 63	38.5 52	40.1 42
55	RA DEC	15 34 26 44	20.7 16	21.7 09	22.7 06	23.5 08	24.0 13	24.2 20	24.2 27	23.8 31	23.2 32	22.7 29	22.4 23	22.6 15	23.3 06
56	RA DEC	15 59 -22 35	51.6 58	52.6 61	53.6 64	54.5 67	55.2 68	55.6 69	55.7 69	55.5 69	55.0 68	54.5 67	54.3 65	54.5 65	55.2 66
57	RA DEC	16 28 -26 24	54.9 53	55.9 55	56.9 57	57.9 59	58.6 61	59.2 62	59.4 63	59.2 63	58.7 63	58.2 61	57.9 59	58.0 58	58.6 58
58	RA DEC	16 47 -69 00	47.5 45	49.6 40	51.9 40	54.2 43	56.1 48	57.3 55	57.7 63	57.0 69	55.6 71	54.1 69	53.1 63	53.1 55	54.2 48
59	RA DEC	17 09 -15 42	54.9 56	55.7 59	56.6 61	57.6 62	58.3 61	59.0 60	59.3 58	59.2 58	58.8 57	58.3 56	57.9 56	57.9 56	58.3 58
60	RA DEC	17 33 -37 05	03.6 54	04.6 53	05.6 53	06.8 53	07.8 54	08.6 56	09.0 58	09.0 61	08.5 62	07.9 62	07.4 59	07.3 56	07.7 54
61	RA DEC	17 34 12 33	33.4 51	34.1 45	34.9 41	35.8 41	36.6 45	37.2 51	37.5 57	37.4 61	37.0 65	36.4 65	36.0 63	35.9 58	36.2 52
62	RA DEC	17 56 51 29	23.5 18	24.2 08	25.2 02	26.5 02	27.5 07	28.3 16	28.5 26	28.2 35	27.4 41	26.3 42	25.4 39	24.8 31	24.9 20
63	RA DEC	18 23 -34 23	38.2 22	39.0 19	39.9 18	41.0 17	42.0 16	42.9 17	43.5 18	43.7 20	43.3 22	42.7 22	42.2 21	41.9 19	42.2 17
64	RA DEC	18 36 38 46	39.0 32	39.5 23	40.3 17	41.3 16	42.3 20	43.1 28	43.5 37	43.5 46	43.0 53	42.2 55	41.5 53	41.0 47	41.0 38
65	RA DEC	18 54 -26 18	45.9 27	46.5 26	47.3 25	48.3 23	49.3 22	50.2 20	50.8 19	51.1 20	50.8 21	50.3 22	49.8 22	49.5 21	49.6 20
66	RA DEC	19 50 08 50	23.2 50	23.6 46	24.1 43	24.9 42	25.8 45	26.7 51	27.4 57	27.7 63	27.5 68	27.1 70	26.6 70	26.3 67	26.2 63
67	RA DEC	20 25 -56 45	0 .6 46	0 .9 39	01.8 31	03.0 25	04.5 21	06.1 20	07.3 22	08.0 27	07.9 33	07.3 37	06.3 39	05.5 37	05.1 32
68	RA DEC	20 41 45 14	08.5 76	08.5 67	09.0 59	09.8 55	10.9 55	12.1 61	12.9 70	13.4 81	13.2 90	12.7 97	11.9 100	11.2 97	10.7 91
69	RA DEC	21 40 -77 25	34.9 44	34.2 34	34.9 24	37.0 14	39.9 07	43.3 04	46.5 05	48.6 11	49.1 20	47.9 28	45.5 32	42.8 32	40.6 26
★ 70	RA DEC	21 43 09 50	47.6 23	47.6 20	47.8 17	48.3 16	49.1 18	50.1 23	51.0 30	51.6 37	51.8 42	51.6 45	51.3 46	50.8 45	50.5 42
★ 71	RA DEC	22 07 -46 59	44.1 68	43.9 62	44.1 55	44.8 47	45.8 40	47.0 34	48.3 32	49.2 34	49.6 38	49.4 44	48.9 49	48.2 50	47.6 49
72	RA DEC	22 57 -29 39	13.1 57	12.9 55	13.0 51	13.3 45	14.0 38	15.0 31	16.1 27	17.0 25	17.4 26	17.5 29	17.2 34	16.8 37	16.3 37
73	RA DEC	23 04 15 09	22.2 54	22.0 50	22.0 47	22.3 45	22.9 46	23.8 50	24.8 57	25.6 64	26.1 70	26.2 74	25.9 76	25.6 76	25.2 74

Table 10b.(1). Apparent Places of Stars, 1988 (Mils of Declination)

Star No.	Right ascension Declination	(Hr Min) MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH											
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
			Seconds (time of RA or arc of declination)											
1	RA DEC	00 07 515	45.5 1.03	45.1 1.01	44.9 1.00	45.0 .98	45.6 .97	46.5 .98	47.6 1.00	48.6 1.04	49.3 1.08	49.6 1.11	49.6 1.13	49.4 1.15
2	RA DEC	00 08 1050	30.8 .46	29.9 .44	29.3 .41	29.4 .37	30.2 .34	31.6 .34	33.2 .35	34.6 .39	35.6 .44	36.1 .49	35.9 .54	35.3 .56
3	RA DEC	00 25 -1374	10.5 .71	08.0 .68	06.6 .63	06.2 .58	07.3 .52	09.6 .47	12.7 .45	15.9 .45	18.3 .47	19.2 .52	18.4 .56	16.4 .59
4	RA DEC	00 25 -753	42.1 .33	41.6 .32	41.3 .29	41.3 .25	41.8 .21	42.7 .17	43.9 .13	45.1 .12	45.9 .13	46.3 .15	46.3 .19	45.9 .21
5	RA DEC	00 39 1003	48.5 1.03	47.7 1.02	47.1 .99	47.0 .95	47.6 .93	48.9 .91	50.4 .93	51.8 .96	52.9 1.00	53.5 1.05	53.6 1.10	53.1 1.13
6	RA DEC	00 42 320	59.5 .96	59.2 .96	59.0 .95	59.0 .93	59.4 .90	60.1 .86	61.1 .83	62.1 .80	62.9 .80	63.3 .80	63.4 .82	63.2 .84
7	RA DEC	00 55 1078	58.0 .36	57.0 .35	56.2 .32	56.0 .28	56.6 .25	57.9 .23	59.5 .24	61.2 .27	62.4 .31	63.2 .36	63.3 .41	62.9 .44
8	RA DEC	01 24 1069	61.2 .85	60.2 .84	59.4 .82	59.0 .78	59.4 .75	60.6 .73	62.2 .73	63.9 .76	65.3 .80	66.2 .84	66.6 .89	66.3 .93
9	RA DEC	01 37 -1018	17.7 .69	16.7 .69	16.0 .66	15.5 .61	15.6 .56	16.3 .51	17.6 .47	19.1 .45	20.4 .45	21.2 .48	21.4 .53	21.0 .57
10			SEE TABLE 11. APPARENT PLACES OF POLARIS, 1988											
11	RA DEC	02 06 416	30.1 .16	29.8 .16	29.4 .15	29.1 .13	29.3 .13	29.9 .13	30.9 .15	31.9 .17	32.9 .20	33.6 .22	34.0 .24	34.1 .25
12	RA DEC	02 57 -717	49.8 .41	49.2 .42	48.6 .41	48.0 .39	47.9 .34	48.2 .29	49.0 .25	50.1 .21	51.1 .20	52.0 .22	52.5 .25	52.6 .29
13	RA DEC	03 01 71	39.9 .91	39.6 .90	39.2 .90	38.9 .90	38.9 .91	39.3 .92	40.1 .95	41.0 .98	41.9 1.00	42.7 1.00	43.2 1.00	43.5 1.00
14	RA DEC	03 23 885	28.8 .76	28.3 .77	27.6 .77	26.9 .75	26.8 .72	27.3 .70	28.4 .69	29.7 .70	31.1 .71	32.3 .74	33.2 .77	33.7 .81
15	RA DEC	04 35 293	15.1 .13	15.0 .13	14.6 .12	14.1 .12	13.8 .12	14.0 .12	14.6 .13	15.5 .15	16.4 .16	17.4 .17	18.2 .17	18.7 .17
16	RA DEC	05 13 -145	59.0 1.01	58.9 1.03	58.5 1.04	58.0 1.04	57.6 1.03	57.6 1.01	58.1 .98	58.8 .95	59.6 .94	60.5 .93	61.4 .95	62.0 .97
17	RA DEC	05 15 817	49.9 .60	49.8 .62	49.3 .63	48.5 .63	48.0 .61	48.1 .59	48.7 .58	49.8 .57	51.0 .56	52.3 .57	53.6 .58	54.4 .60
18	RA DEC	05 24 112	30.6 .74	30.6 .73	30.2 .73	29.7 .73	29.3 .73	29.3 .74	29.8 .76	30.5 .77	31.4 .79	32.3 .79	33.2 .78	33.8 .77
19	RA DEC	05 25 508	33.5 .46	33.5 .47	33.1 .47	32.5 .47	32.1 .46	32.2 .45	32.7 .45	33.5 .45	34.5 .45	35.5 .46	36.6 .46	37.3 .47
20	RA DEC	05 35 -21	37.6 .46	37.6 .48	37.3 .48	36.7 .48	36.4 .48	36.3 .46	36.7 .44	37.4 .42	38.2 .40	39.1 .40	40.0 .41	40.7 .43
21	RA DEC	05 40 34	10.6 .61	10.5 .62	10.2 .63	09.7 .63	09.3 .62	09.2 .61	09.6 .59	10.3 .56	11.1 .55	12.0 .54	12.9 .55	13.6 .57
22	RA DEC	05 54 131	32.8 .69	32.8 .68	32.5 .67	32.0 .67	31.6 .68	31.5 .69	31.9 .70	32.5 .72	33.4 .73	34.3 .73	35.2 .72	35.9 .71
23	RA DEC	06 23 -936	43.4 .66	43.2 .71	42.4 .74	41.3 .75	40.3 .73	39.7 .70	39.7 .65	40.2 .60	41.2 .56	42.4 .56	43.6 .58	44.5 .62
24	RA DEC	06 37 291	02.7 .77	02.9 .77	02.6 .77	02.1 .77	01.7 .77	01.5 .77	01.8 .77	02.4 .78	03.2 .78	04.1 .78	05.1 .77	06.0 .76
25	RA DEC	06 44 -296	38.7 .84	38.8 .87	38.5 .89	37.9 .90	37.4 .89	37.2 .87	37.3 .84	37.8 .81	38.5 .79	39.3 .79	40.3 .80	41.1 .83

Table 10b.(1). Apparent Places of Stars, 1988 (Mils of Declination)—Continued

Star No.	Right Ascension Declination (Hr Min) MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
		Seconds (time of RA or arc of declination)												
26	RA DEC 06 58 - 514	10.8 .72	10.9 .77	10.6 .79	09.9 .80	09.3 .80	09.0 .77	09.0 .74	09.4 .70	10.1 .67	11.0 .66	12.0 .67	12.9 .71	13.4 .75
27	RA DEC 07 07 - 468	55.7 .82	55.8 .87	55.5 .89	54.9 .90	54.3 .90	54.0 .87	54.0 .84	54.4 .80	55.1 .78	56.0 .77	57.0 .79	57.8 .81	58.4 .86
28	RA DEC 07 33 567	51.9 .40	52.3 .41	52.2 .42	51.7 .43	51.1 .44	50.8 .43	50.9 .42	51.4 .41	52.1 .39	53.1 .38	54.3 .37	55.3 .36	56.2 .36
29	RA DEC 07 38 93	41.9 .48	42.2 .46	42.1 .45	41.7 .45	41.2 .45	40.9 .46	41.0 .47	41.4 .48	42.0 .49	42.8 .48	43.8 .47	44.7 .45	45.4 .42
30	RA DEC 07 44 498	36.7 .79	37.1 .79	37.0 .80	36.5 .81	36.0 .81	35.7 .81	35.8 .80	36.2 .80	36.9 .78	37.8 .77	38.9 .75	39.9 .74	40.7 .74
31	RA DEC 08 09 - 840	11.4 .84	11.7 .90	11.4 .94	10.6 .97	09.8 .98	09.1 .96	08.7 .93	08.8 .88	09.3 .84	10.3 .82	11.5 .82	12.6 .86	13.5 .91
32	RA DEC 08 22 -1057	18.1 .19	18.4 .24	17.9 .29	16.9 .33	15.7 .34	14.6 .32	14.0 .29	13.8 .24	14.4 .20	15.5 .18	17.0 .18	18.4 .20	19.5 .25
33	RA DEC 09 07 - 771	34.4 .20	35.0 .26	35.0 .30	34.5 .34	33.8 .35	33.1 .34	32.7 .32	32.6 .28	32.9 .24	33.7 .21	34.7 .21	35.9 .24	36.9 .28
34	RA DEC 09 13 -1238	06.4 .45	07.2 .51	06.8 .57	05.5 .61	03.8 .63	02.1 .63	0 .8 .61	0 .1 .57	0 .3 .52	01.5 .49	03.5 .47	05.6 .49	07.2 .54
35	RA DEC 09 27 - 152	0 .9 .97	01.5 1.01	01.7 1.03	01.4 1.04	01.0 1.04	0 .7 1.04	0 .5 1.02	0 .6 1.01	0 .8 .99	01.4 .99	02.3 1.00	03.3 1.03	04.2 1.06
36	RA DEC 10 07 213	45.1 .79	45.8 .77	46.2 .77	46.1 .77	45.7 .78	45.4 .79	45.2 .79	45.1 .79	45.3 .79	45.8 .77	46.6 .75	47.6 .72	48.6 .69
37	RA DEC 11 01 1003	09.3 .43	10.7 .43	11.4 .46	11.4 .50	10.8 .53	10.0 .54	09.3 .54	08.9 .51	08.8 .47	09.2 .42	10.2 .37	11.6 .34	13.3 .32
38	RA DEC 11 03 1098	01.9 .87	03.5 .88	04.3 .91	04.3 .95	03.6 .98	02.6 1.00	01.7 .99	01.1 .96	01.0 .91	01.4 .86	02.6 .81	04.2 .78	06.0 .77
39	RA DEC 11 48 260	27.4 .22	28.4 .20	29.0 .19	29.2 .19	29.1 .21	28.8 .22	28.5 .23	28.3 .23	28.2 .22	28.4 .20	28.9 .17	29.8 .14	30.8 .11
40	RA DEC 11 53 955	13.5 .67	14.9 .67	15.8 .69	16.0 .73	15.7 .76	15.0 .78	14.4 .79	13.8 .77	13.4 .73	13.6 .69	14.3 .63	15.4 .59	16.9 .57
41	RA DEC 12 15 - 310	11.3 .65	12.3 .69	13.0 .72	13.2 .75	13.2 .76	13.0 .76	12.8 .76	12.5 .75	12.3 .73	12.3 .72	12.8 .72	13.7 .74	14.7 .77
42	RA DEC 12 25 -1120	54.6 .50	56.4 .54	57.5 .58	58.0 .64	57.9 .68	57.2 .72	56.3 .73	55.3 .72	54.5 .68	54.4 .65	55.2 .61	56.6 .60	58.5 .61
43	RA DEC 12 30 -1014	29.0 .08	30.5 .12	31.5 .16	32.0 .21	31.9 .26	31.5 .29	30.8 .30	30.0 .29	29.4 .25	29.3 .22	29.9 .19	31.2 .18	32.8 .19
44	RA DEC 12 46 -1059	59.9 .90	61.6 .93	62.7 .98	63.3 1.02	63.3 1.07	62.9 1.10	62.2 1.12	61.2 1.11	60.5 1.08	60.3 1.04	60.9 1.01	62.2 1.00	63.9 1.00
45	RA DEC 12 53 995	30.9 .90	32.5 .89	33.6 .90	34.2 .94	34.1 .98	33.5 1.00	32.8 1.02	32.0 1.01	31.3 .98	31.1 .94	31.4 .88	32.4 .83	33.8 .79
46	RA DEC 13 23 977	27.0 .46	28.5 .44	29.7 .45	30.3 .48	30.4 .53	30.0 .56	29.3 .58	28.5 .57	27.7 .55	27.3 .51	27.5 .45	28.3 .40	29.6 .36
47	RA DEC 13 24 - 197	33.2 .32	34.3 .35	35.1 .38	35.6 .39	35.8 .40	35.8 .40	35.6 .40	35.3 .39	35.0 .38	34.9 .37	35.1 .38	35.8 .39	36.8 .42
48	RA DEC 13 47 877	04.1 .64	05.5 .62	06.6 .62	07.3 .65	07.5 .69	07.2 .73	06.7 .75	06.0 .75	05.3 .73	04.9 .69	05.0 .64	05.6 .59	06.7 .55
49	RA DEC 14 02 -1072	56.4 .22	58.3 .24	59.8 .27	60.8 .32	61.4 .36	61.4 .40	60.9 .42	60.0 .43	59.0 .41	58.5 .38	58.7 .35	59.6 .32	61.2 .32

Table 10b.(1). Apparent Places of Stars, 1988 (Mils of Declination)—Continued

Star No.	Right ascen- sion Decli- nation	(Hr Min) MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
50	RA DEC	14 05 - 645	57.5 .51	58.7 .54	59.7 .57	60.5 .60	60.8 .62	60.9 .64	60.8 .65	60.3 .65	59.8 .64	59.5 .62	59.7 .60	60.4 .60	61.4 .60
51	RA DEC	14 15 341	06.4 1.06	07.5 1.03	08.4 1.02	09.0 1.02	09.3 1.04	09.4 1.07	09.2 1.08	08.8 1.09	08.4 1.09	08.1 1.07	08.2 1.04	08.6 1.00	09.5 .96
52	RA DEC	14 38 -1080	44.7 .60	46.6 .61	48.2 .64	49.4 .68	50.1 .72	50.3 .76	49.9 .79	49.1 .80	48.0 .79	47.3 .76	47.2 .72	47.9 .70	49.4 .68
53	RA DEC	14 50 284	11.9 .32	13.0 .35	14.0 .37	14.7 .39	15.2 .40	15.4 .40	15.4 .40	15.1 .39	14.7 .39	14.3 .38	14.4 .38	14.8 .39	15.7 .40
54	RA DEC	14 50 1318	42.5 1.08	45.1 1.05	47.5 1.05	49.5 1.08	50.2 1.13	49.6 1.18	48.0 1.20	45.8 1.21	43.4 1.20	41.5 1.16	40.5 1.11	40.7 1.05	42.4 1.00
55	RA DEC	15 34 475	09.9 .57	10.9 .53	11.9 .51	12.7 .52	13.3 .55	13.5 .58	13.5 .61	13.1 .62	12.6 .63	12.1 .61	11.9 .59	12.1 .55	12.7 .50
56	RA DEC	15 59 - 401	36.1 .59	37.2 .60	38.2 .62	39.1 .63	39.8 .64	40.3 .64	40.4 .65	40.2 .65	39.8 .64	39.3 .64	39.2 .63	39.4 .63	40.1 .64
57	RA DEC	16 28 - 469	38.9 .46	39.9 .47	40.9 .49	41.9 .50	42.7 .51	43.3 .51	43.5 .52	43.4 .52	42.9 .52	42.4 .52	42.2 .51	42.3 .50	43.0 .51
58	RA DEC	16 47 -1226	19.6 .79	21.7 .77	24.0 .77	26.4 .78	28.2 .81	29.5 .85	29.9 .88	29.3 .92	28.0 .93	26.5 .92	25.6 .89	25.6 .85	26.7 .82
59	RA DEC	17 09 - 279	40.0 .33	40.8 .34	41.8 .36	42.7 .36	43.5 .36	44.2 .35	44.5 .35	44.5 .35	44.1 .34	43.6 .34	43.3 .34	43.3 .34	43.8 .35
60	RA DEC	17 32 - 659	46.0 .51	46.9 .51	48.0 .51	49.2 .51	50.2 .52	51.1 .53	51.5 .54	51.5 .56	51.1 .56	50.5 .56	50.1 .55	50.0 .54	50.5 .53
61	RA DEC	17 34 223	21.3 .38	22.1 .35	22.9 .33	23.8 .32	24.6 .34	25.3 .37	25.6 .40	25.5 .42	25.1 .44	24.6 .44	24.2 .43	24.1 .40	24.4 .37
62	RA DEC	17 56 915	17.5 .32	18.2 .27	19.2 .24	20.5 .23	21.6 .26	22.3 .30	22.6 .35	22.3 .40	21.4 .42	20.4 .43	19.5 .41	19.0 .37	19.0 .32
63	RA DEC	18 23 - 611	21.0 .44	21.8 .43	22.8 .43	23.9 .42	25.0 .42	25.9 .42	26.6 .43	26.7 .44	26.4 .45	25.9 .46	25.4 .45	25.2 .44	25.5 .43
64	RA DEC	18 36 689	30.1 .23	30.7 .19	31.5 .16	32.5 .15	33.5 .17	34.3 .21	34.8 .25	34.7 .30	34.3 .33	33.6 .34	32.8 .33	32.4 .30	32.4 .25
65	RA DEC	18 54 - 467	29.9 .83	30.6 .82	31.4 .82	32.4 .81	33.4 .80	34.4 .79	35.0 .79	35.3 .80	35.1 .80	34.6 .81	34.1 .81	33.9 .80	34.1 .80
66	RA DEC	19 50 157	10.6 .05	10.9 .02	11.5 .01	12.3 0.00	13.2 .02	14.1 .05	14.8 .08	15.2 .11	15.1 .13	14.7 .14	14.2 .14	13.9 .13	13.8 .10
67	RA DEC	20 24 -1009	40.6 .40	41.0 .36	41.9 .32	43.2 .29	44.8 .27	46.4 .27	47.7 .28	48.4 .30	48.4 .33	47.8 .36	46.9 .37	46.2 .36	45.8 .33
68	RA DEC	20 40 804	59.4 .22	59.4 .17	59.8 .14	60.7 .11	61.8 .11	62.9 .14	63.8 .19	64.2 .24	64.1 .29	63.6 .32	62.8 .33	62.1 .32	61.6 .29
69	RA DEC	21 40 -1376	08.5 .88	07.9 .83	08.8 .78	11.0 .73	14.0 .70	17.5 .68	20.8 .69	23.1 .72	23.6 .76	22.5 .80	20.2 .82	17.6 .82	15.6 .79
★ 70	RA DEC	21 43 174	34.8 .55	34.8 .54	35.1 .52	35.6 .52	36.4 .53	37.4 .56	38.3 .59	39.0 .62	39.2 .65	39.1 .67	38.7 .67	38.3 .66	38.0 .65
★ 71	RA DEC	22 07 - 835	28.3 .99	28.2 .96	28.5 .93	29.1 .88	30.2 .85	31.5 .82	32.8 .81	33.8 .82	34.2 .84	34.1 .87	33.5 .89	32.9 .90	32.4 .89
72	RA DEC	22 56 - 527	59.1 .81	59.0 .80	59.0 .78	59.4 .75	60.1 .72	61.2 .68	62.3 .66	63.2 .65	63.7 .65	63.8 .67	63.6 .69	63.2 .70	62.8 .71
73	RA DEC	23 04 269	09.1 .18	08.9 .16	08.9 .14	09.3 .13	09.9 .14	10.9 .16	11.9 .20	12.7 .23	13.2 .26	13.3 .28	13.1 .29	12.8 .29	12.4 .28

Table 10b.(2). Apparent Places of Stars, 1989 (Mils of Declination)

Star No.	Right ascension Declination	(Hr Min) MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH											
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
			Seconds (time of RA or arc of declination)											
1	RA DEC	00 07 516	48.9 .14	48.6 .12	48.4 .10	48.5 .08	49.1 .07	50.0 .08	51.1 .11	52.1 .15	52.8 .19	53.1 .22	53.1 .24	52.8 .25
2	RA DEC	00 08 1050	34.4 .57	33.5 .55	33.0 .52	33.1 .48	33.9 .45	35.2 .44	36.9 .46	38.4 .50	39.3 .55	39.7 .60	39.6 .64	39.0 .67
3	RA DEC	00 25 -1374	13.6 .59	11.1 .57	09.6 .52	09.3 .46	10.4 .41	12.7 .37	15.6 .34	18.9 .34	21.3 .37	22.2 .41	21.3 .45	19.3 .48
4	RA DEC	00 25 -753	45.3 .22	44.8 .21	44.5 .19	44.5 .15	45.0 .10	45.9 .06	47.1 .03	48.2 .01	49.1 .02	49.5 .05	49.4 .08	49.0 .11
5	RA DEC	00 39 1004	52.4 .14	51.5 .12	51.0 .10	50.9 .06	51.5 .03	52.7 .02	54.2 .03	55.7 .06	56.8 .11	57.4 .16	57.4 .20	57.1 .23
6	RA DEC	00 43 -320	02.9 .85	02.5 .85	02.3 .84	02.3 .82	02.7 .80	03.4 .76	04.4 .73	05.4 .70	06.2 .69	06.6 .70	06.6 .72	06.5 .73
7	RA DEC	00 56 1078	02.1 .46	01.1 .45	0 .3 .42	0 .2 .39	0 .7 .35	02.0 .34	03.7 .34	05.4 .37	06.6 .41	07.3 .46	07.5 .51	07.1 .55
8	RA DEC	01 25 1069	05.6 .95	04.6 .95	03.8 .92	03.5 .89	03.9 .85	05.1 .83	06.7 .83	08.4 .86	09.8 .90	10.7 .94	11.0 .99	10.8 1.02
9	RA DEC	01 37 -1018	20.1 .59	19.1 .59	18.3 .56	17.9 .52	18.0 .46	18.7 .41	19.9 .37	21.4 .35	22.7 .36	23.5 .39	23.7 .43	23.3 .47
10	SEE TABLE 11. APPARENT PLACES OF POLARIS, 1989													
11	RA DEC	02 06 416	33.9 .25	33.5 .25	33.1 .24	32.9 .22	33.1 .22	33.7 .22	34.6 .24	35.7 .26	36.7 .29	37.3 .31	37.7 .33	37.8 .34
12	RA DEC	02 57 -717	52.3 .33	51.7 .34	51.1 .34	50.5 .31	50.4 .27	50.7 .22	51.4 .18	52.5 .14	53.6 .13	54.4 .15	55.0 .18	55.1 .22
13	RA DEC	03 01 71	43.4 .99	43.1 .97	42.7 .97	42.4 .97	42.4 .98	42.7 1.00	43.5 1.02	44.5 1.04	45.4 1.07	46.1 1.07	46.7 1.07	46.9 1.06
14	RA DEC	03 23 885	33.6 .83	33.0 .84	32.4 .84	31.8 .82	31.6 .79	32.1 .77	33.1 .75	34.5 .76	35.9 .78	37.1 .81	38.0 .84	38.4 .87
15	RA DEC	04 35 293	19.0 .17	18.8 .16	18.4 .16	17.9 .16	17.7 .16	17.8 .16	18.4 .17	19.3 .18	20.2 .20	21.1 .20	22.0 .20	22.5 .20
16	RA DEC	05 14 -145	02.2 1.00	02.1 1.01	01.7 1.02	01.2 1.02	0 .8 1.01	0 .8 .99	01.2 .97	02.0 .94	02.8 .92	03.7 .92	04.5 .93	05.1 .96
17	RA DEC	05 15 817	54.9 .62	54.7 .64	54.2 .65	53.5 .64	53.0 .63	53.0 .60	53.6 .59	54.7 .58	55.9 .58	57.2 .58	58.4 .59	59.3 .61
18	RA DEC	05 24 112	34.2 .76	34.1 .74	33.7 .74	33.2 .74	32.9 .74	32.9 .75	33.3 .77	34.1 .78	34.9 .80	35.8 .80	36.7 .79	37.4 .78
19	RA DEC	05 25 508	37.7 .47	37.6 .48	37.3 .48	36.7 .48	36.3 .47	36.3 .46	36.8 .46	37.7 .46	38.7 .46	39.7 .47	40.7 .47	41.5 .47
20	RA DEC	05 35 -21	41.0 .45	41.0 .47	40.6 .48	40.1 .48	39.8 .47	39.7 .45	40.1 .43	40.8 .41	41.6 .39	42.5 .39	43.3 .40	44.0 .42
21	RA DEC	05 40 -34	13.9 .60	13.9 .62	13.5 .63	13.0 .63	12.7 .62	12.6 .60	12.9 .58	13.6 .56	14.5 .54	15.3 .54	16.2 .55	16.9 .57
22	RA DEC	05 54 131	36.4 .69	36.4 .68	36.1 .67	35.6 .67	35.2 .67	35.1 .68	35.4 .70	36.1 .71	37.0 .72	37.8 .72	38.7 .72	39.5 .70
23	RA DEC	06 23 -936	44.9 .67	44.6 .72	43.9 .75	42.8 .76	41.8 .75	41.2 .71	41.1 .67	41.7 .62	42.6 .58	43.8 .57	45.1 .59	46.0 .64
24	RA DEC	06 37 291	06.5 .75	06.7 .74	06.4 .74	06.0 .74	05.5 .75	05.3 .75	05.6 .75	06.2 .76	07.0 .76	07.9 .76	08.9 .75	09.7 .73
25	RA DEC	06 44 -296	41.6 .87	41.7 .90	41.4 .92	40.8 .93	40.3 .92	40.1 .90	40.2 .87	40.7 .84	41.4 .82	42.2 .82	43.2 .83	44.0 .86

Table 10b.(2). Apparent Places of Stars, 1989 (Mils of Declination)—Continued

Star No.	Right ascen- sion Declination	(Hr Min) MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
26	RA DEC	06 58 -514	13.4 .75	13.5 .80	13.2 .82	12.5 .83	12.0 .82	11.6 .80	11.6 .77	12.0 .73	12.7 .70	13.6 .69	14.6 .71	15.5 .74	16.0 .79
27	RA DEC	07 07 -468	58.4 .86	58.5 .90	58.2 .93	57.7 .94	57.1 .93	56.7 .91	56.7 .88	57.1 .84	57.8 .81	58.7 .80	59.6 .82	60.5 .85	61.1 .90
28	RA DEC	07 33 -567	56.2 .36	56.5 .36	56.4 .38	55.9 .38	55.4 .39	55.0 .38	55.1 .37	55.6 .36	56.4 .34	57.3 .33	58.4 .32	59.5 .31	60.3 .31
29	RA DEC	07 38 -93	45.4 .42	45.7 .40	45.6 .39	45.2 .39	44.7 .39	44.4 .40	44.5 .41	44.8 .42	45.4 .43	46.2 .43	47.2 .41	48.1 .39	48.8 .36
30	RA DEC	07 44 -498	40.7 .74	41.1 .74	41.0 .75	40.6 .76	40.1 .76	39.7 .76	39.8 .75	40.2 .74	40.9 .73	41.8 .72	42.8 .70	43.9 .69	44.8 .68
31	RA DEC	08 09 -840	13.5 .91	13.7 .96	13.4 1.01	12.7 1.03	11.9 1.04	11.1 1.02	10.8 .99	10.9 .95	11.4 .91	12.3 .88	13.5 .89	14.7 .92	15.6 .97
32	RA DEC	08 22 -1057	19.5 .25	19.8 .31	19.3 .36	18.3 .40	17.1 .41	16.0 .39	15.4 .36	15.3 .31	15.8 .27	16.9 .24	18.4 .24	19.9 .27	20.9 .32
33	RA DEC	09 07 -771	36.9 .28	37.5 .34	37.4 .38	37.0 .42	36.3 .43	35.6 .43	35.2 .40	35.1 .36	35.4 .33	36.1 .30	37.2 .30	38.4 .32	39.4 .37
34	RA DEC	09 13 -1238	07.2 .54	08.0 .60	07.6 .65	06.4 .70	04.7 .72	03.0 .72	01.6 .70	01.0 .65	01.2 .61	02.4 .57	04.4 .56	06.5 .58	08.2 .62
35	RA DEC	09 27 -153	04.2 .06	04.8 .10	04.9 .12	04.7 .13	04.3 .14	04.0 .13	03.8 .11	03.8 .10	04.1 .08	04.7 .08	05.5 .09	06.5 .12	07.4 .15
36	RA DEC	10 07 -213	48.6 .69	49.4 .67	49.7 .67	49.6 .67	49.3 .68	48.9 .69	48.7 .69	48.7 .69	48.8 .69	49.3 .67	50.1 .65	51.1 .62	52.1 .60
37	RA DEC	11 01 -1003	13.3 .32	14.6 .33	15.2 .35	15.3 .39	14.7 .42	13.9 .44	13.1 .43	12.7 .40	12.6 .36	13.0 .31	14.0 .27	15.4 .23	17.1 .21
38	RA DEC	11 03 -1098	06.0 .77	07.5 .78	08.2 .80	08.2 .84	07.6 .87	06.5 .89	05.6 .88	05.0 .85	04.9 .81	05.3 .76	06.4 .71	08.0 .67	09.8 .66
39	RA DEC	11 48 -259	30.8 1.11	31.8 1.08	32.3 1.08	32.6 1.08	32.5 1.09	32.2 1.11	31.9 1.12	31.7 1.12	31.6 1.11	31.7 1.09	32.2 1.07	33.1 1.03	34.2 1.00
40	RA DEC	11 53 -955	16.9 .57	18.3 .56	19.1 .58	19.4 .61	19.1 .65	18.4 .67	17.7 .68	17.1 .66	16.8 .62	16.9 .58	17.5 .53	18.7 .48	20.2 .45
41	RA DEC	12 15 -310	14.7 .77	15.7 .80	16.4 .83	16.7 .85	16.7 .87	16.5 .87	16.2 .86	15.9 .85	15.7 .84	15.8 .82	16.2 .82	17.1 .84	18.2 .87
42	RA DEC	12 25 -1120	58.5 .61	60.3 .65	61.3 .69	61.9 .75	61.7 .80	61.1 .82	60.2 .83	59.2 .82	58.4 .79	58.3 .75	59.0 .72	60.5 .70	62.4 .72
43	RA DEC	12 30 -1014	32.8 .19	34.3 .23	35.3 .27	35.8 .33	35.8 .37	35.3 .40	34.6 .40	33.8 .40	33.2 .37	33.1 .33	33.7 .30	35.0 .28	36.6 .30
44	RA DEC	12 47 -1060	03.9 0.00	05.6 .03	06.7 .08	07.3 .13	07.4 .18	06.9 .21	06.2 .22	05.3 .21	04.6 .19	04.3 .15	04.9 .11	06.2 .10	08.0 .11
45	RA DEC	12 53 -995	33.8 .79	35.3 .78	36.4 .79	37.0 .83	36.9 .87	36.3 .90	35.5 .91	34.7 .90	34.1 .87	33.8 .83	34.1 .77	35.1 .72	36.5 .68
46	RA DEC	13 23 -977	29.6 .36	31.1 .34	32.2 .35	32.9 .38	33.0 .42	32.5 .46	31.8 .48	31.0 .47	30.3 .45	29.9 .41	30.0 .35	30.8 .30	32.1 .26
47	RA DEC	13 24 -197	36.8 .42	37.8 .45	38.6 .48	39.2 .50	39.4 .50	39.3 .50	39.1 .50	38.8 .49	38.5 .48	38.4 .47	38.6 .48	39.3 .49	40.3 .52
48	RA DEC	13 47 -877	06.7 .55	08.1 .52	09.1 .53	09.9 .56	10.1 .60	09.8 .63	09.2 .65	08.5 .65	07.8 .63	07.4 .60	07.4 .55	08.0 .50	09.2 .45
49	RA DEC	14 03 -1072	01.2 .32	03.1 .33	04.5 .37	05.7 .41	06.2 .45	06.2 .49	05.7 .51	04.8 .52	03.9 .50	03.3 .47	03.5 .43	04.4 .41	06.1 .40

Table 10b.(4). Apparent Places of Stars, 1991 (Mils of Declination)

Star No.	Right Ascension Declination	(Hr Min) MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
1	RA DEC	00 07 516	55.9 .36	55.5 .34	55.3 .32	55.4 .29	55.9 .29	56.8 .30	57.9 .32	58.9 .36	59.6 .40	59.9 .42	59.9 .45	59.6 .46	59.2 .45
2	RA DEC	00 08 1050	41.9 .79	40.9 .77	40.4 .73	40.5 .69	41.3 .66	42.7 .65	44.3 .67	45.7 .71	46.7 .76	47.2 .80	47.0 .85	46.4 .88	45.5 .88
3	RA DEC	00 25 -1374	19.1 .38	16.6 .36	15.1 .31	14.6 .26	15.5 .20	17.8 .15	20.8 .13	24.0 .13	26.3 .16	27.2 .20	26.4 .24	24.3 .27	21.5 .28
4	RA DEC	00 25 - 752	51.5 1.02	51.0 1.01	50.7 .98	50.6 .94	51.1 .90	52.0 .85	53.1 .82	54.2 .81	55.1 .82	55.5 .84	55.4 .88	55.0 .90	54.4 .92
5	RA DEC	00 39 1004	60.3 .35	59.4 .34	58.8 .31	58.7 .27	59.3 .24	60.6 .23	62.0 .24	63.5 .27	64.6 .31	65.2 .36	65.3 .40	64.8 .43	64.1 .44
6	RA DEC	00 43 - 320	09.3 .64	09.0 .65	08.7 .64	08.7 .62	09.1 .59	09.8 .55	10.8 .52	11.7 .49	12.5 .49	12.9 .49	13.0 .51	12.7 .53	12.4 .54
7	RA DEC	00 56 1078	10.5 .67	09.5 .66	08.7 .63	08.5 .59	09.1 .55	10.4 .54	12.0 .54	13.6 .57	15.0 .61	15.7 .66	15.9 .71	15.4 .75	14.6 .76
8	RA DEC	01 25 1070	14.7 .14	13.7 .14	12.9 .11	12.5 .07	12.9 .04	14.1 .02	15.6 .02	17.3 .04	18.7 .08	19.7 .13	20.0 .18	19.8 .21	19.1 .23
9	RA DEC	01 37 -1018	24.6 .40	23.6 .40	22.8 .38	22.3 .33	22.3 .28	23.1 .23	24.3 .19	25.7 .17	27.0 .18	27.8 .21	28.0 .25	27.5 .29	26.7 .32
10	SEE TABLE 11. APPARENT PLACES OF POLARIS,1991														
11	RA DEC	02 06 416	41.4 .42	41.0 .42	40.6 .40	40.3 .39	40.5 .39	41.1 .39	42.0 .40	43.0 .43	44.0 .45	44.7 .48	45.1 .49	45.2 .50	45.0 .50
12	RA DEC	02 57 - 716	57.1 1.19	56.5 1.20	55.8 1.20	55.2 1.18	55.1 1.14	55.4 1.09	56.1 1.04	57.2 1.01	58.2 1.00	59.1 1.01	59.6 1.05	59.7 1.09	59.3 1.13
13	RA DEC	03 01 72	50.3 .12	49.9 .11	49.5 .10	49.2 .10	49.1 .11	49.5 .13	50.3 .15	51.2 .18	52.1 .20	52.8 .21	53.4 .20	53.6 .19	53.5 .18
14	RA DEC	03 23 885	43.2 .95	42.6 .96	41.9 .96	41.2 .93	41.1 .91	41.6 .88	42.6 .87	43.9 .88	45.3 .89	46.5 .92	47.4 .95	47.8 .98	47.8 1.00
15	RA DEC	04 35 293	26.5 .22	26.3 .22	25.9 .21	25.4 .21	25.1 .20	25.3 .21	25.8 .22	26.6 .23	27.6 .24	28.5 .25	29.3 .25	29.9 .25	30.1 .24
16	RA DEC	05 14 - 145	08.5 .97	08.4 .99	08.0 1.00	07.4 1.00	07.0 1.00	07.0 .97	07.4 .95	08.1 .92	08.9 .90	09.8 .90	10.6 .91	11.2 .94	11.5 .97
17	RA DEC	05 16 817	04.6 .64	04.4 .66	03.9 .66	03.1 .66	02.6 .64	02.6 .62	03.2 .60	04.2 .59	05.4 .59	06.7 .59	07.9 .60	08.8 .62	09.2 .64
18	RA DEC	05 24 112	41.2 .77	41.1 .76	40.7 .75	40.2 .75	39.8 .75	39.8 .76	40.2 .78	40.9 .79	41.8 .80	42.7 .80	43.5 .80	44.2 .79	44.5 .77
19	RA DEC	05 25 508	46.0 .48	45.9 .49	45.5 .49	44.9 .49	44.5 .48	44.6 .47	45.0 .47	45.8 .47	46.8 .47	47.8 .47	48.8 .48	49.5 .48	49.9 .48
20	RA DEC	05 35 - 21	47.7 .45	47.6 .46	47.2 .47	46.7 .48	46.3 .47	46.3 .45	46.6 .43	47.2 .41	48.1 .40	49.0 .39	49.8 .40	50.5 .43	50.8 .45
21	RA DEC	05 40 - 34	20.5 .60	20.5 .62	20.1 .63	19.5 .63	19.2 .62	19.1 .61	19.4 .59	20.0 .56	20.9 .55	21.8 .55	22.6 .56	23.3 .58	23.6 .61
22	RA DEC	05 54 131	43.4 .67	43.5 .66	43.1 .66	42.6 .65	42.2 .66	42.1 .67	42.4 .68	43.0 .69	43.9 .70	44.8 .70	45.7 .70	46.4 .68	46.8 .66
23	RA DEC	06 23 - 936	47.8 .71	47.6 .76	46.8 .79	45.7 .80	44.7 .79	44.1 .76	44.1 .71	44.5 .66	45.5 .63	46.7 .62	47.9 .64	48.8 .68	49.2 .74
24	RA DEC	06 37 291	14.1 .70	14.2 .69	13.9 .69	13.4 .69	13.0 .69	12.8 .69	13.0 .69	13.5 .70	14.3 .70	15.2 .70	16.2 .69	17.0 .68	17.6 .66
25	RA DEC	06 44 - 296	47.4 .94	47.4 .98	47.1 1.00	46.6 1.00	46.0 1.00	45.8 .98	45.9 .95	46.3 .92	47.0 .90	47.9 .89	48.8 .91	49.6 .94	50.1 .98

Table 10b.(4). Apparent Places of Stars, 1991 (Mils of Declination)—Continued

Star No.	Right ascen- sion Declination	(Hr Min) MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
26	RA DEC	06 58 - 514	18.6 .82	18.7 .87	18.3 .89	17.7 .91	17.1 .90	16.7 .88	16.7 .84	17.1 .80	17.8 .78	18.7 .77	19.7 .78	20.5 .81	21.1 .86
27	RA DEC	07 08 - 468	03.8 .94	03.9 .98	03.6 1.01	03.0 1.02	02.4 1.02	02.0 1.00	02.0 .96	02.4 .93	03.0 .90	03.9 .89	04.9 .90	05.7 .94	06.3 .99
28	RA DEC	07 34 567	04.4 .25	04.8 .26	04.6 .27	04.1 .28	03.5 .28	03.2 .27	03.3 .26	03.7 .25	04.4 .24	05.3 .22	06.5 .21	07.5 .20	08.3 .20
29	RA DEC	07 38 93	52.2 .30	52.5 .28	52.4 .27	51.9 .27	51.4 .27	51.2 .28	51.2 .29	51.5 .30	52.1 .31	52.9 .30	53.8 .29	54.7 .27	55.4 .24
30	RA DEC	07 44 498	48.7 .62	49.1 .63	48.9 .63	48.4 .64	47.9 .65	47.6 .64	47.6 .64	47.9 .63	48.6 .61	49.5 .60	50.6 .58	51.6 .57	52.4 .56
31	RA DEC	08 09 - 841	17.6 .04	17.9 .10	17.6 .14	16.9 .17	16.0 .17	15.3 .16	15.0 .12	15.0 .08	15.5 .04	16.5 .02	17.7 .02	18.8 .05	19.7 .11
32	RA DEC	08 22 -1057	22.4 .40	22.7 .45	22.3 .50	21.3 .54	20.1 .55	19.0 .54	18.3 .50	18.2 .46	18.8 .41	19.8 .39	21.3 .39	22.8 .41	23.9 .47
33	RA DEC	09 07 - 771	41.9 .46	42.4 .51	42.4 .56	41.9 .59	41.2 .60	40.6 .60	40.2 .58	40.0 .54	40.3 .50	41.1 .47	42.1 .47	43.3 .49	44.3 .54
34	RA DEC	09 13 -1238	09.2 .71	09.9 .77	09.6 .82	08.4 .86	06.7 .89	05.0 .89	03.6 .87	03.0 .82	03.2 .78	04.4 .75	06.4 .73	08.5 .75	10.2 .80
35	RA DEC	09 27 - 153	10.6 .24	11.2 .27	11.4 .30	11.1 .31	10.7 .31	10.4 .31	10.1 .29	10.1 .27	10.4 .26	11.0 .26	11.8 .27	12.8 .29	13.7 .33
36	RA DEC	10 07 213	55.5 .50	56.3 .48	56.5 .47	56.4 .47	56.1 .48	55.7 .49	55.5 .49	55.4 .50	55.6 .49	56.0 .48	56.8 .46	57.7 .43	58.8 .40
37	RA DEC	11 01 1003	20.7 .11	22.0 .12	22.6 .14	22.6 .18	22.0 .21	21.2 .22	20.4 .22	19.9 .20	19.8 .16	20.2 .11	21.2 .06	22.5 .02	24.1 0.00
38	RA DEC	11 03 1098	13.5 .55	15.0 .56	15.7 .59	15.6 .63	14.9 .66	13.9 .68	13.0 .67	12.3 .64	12.1 .60	12.5 .55	13.6 .50	15.1 .46	16.9 .44
39	RA DEC	11 48 259	37.4 .89	38.3 .87	38.9 .86	39.1 .87	39.0 .88	38.7 .89	38.4 .90	38.1 .91	38.0 .90	38.1 .88	38.6 .86	39.5 .82	40.5 .79
40	RA DEC	11 53 955	23.4 .35	24.8 .35	25.6 .37	25.8 .40	25.4 .44	24.8 .46	24.1 .47	23.4 .45	23.0 .41	23.1 .37	23.8 .32	24.9 .27	26.3 .24
41	RA DEC	12 15 - 310	21.5 .98	22.5 1.01	23.1 1.04	23.4 1.07	23.4 1.08	23.2 1.08	22.9 1.08	22.6 1.06	22.4 1.05	22.5 1.04	22.9 1.04	23.7 1.05	24.8 1.08
42	RA DEC	12 26 -1120	06.3 .82	08.1 .85	09.2 .90	09.7 .95	09.6 1.00	09.0 1.03	08.0 1.04	07.0 1.03	06.2 1.00	06.1 .96	06.8 .92	08.2 .91	10.2 .92
43	RA DEC	12 30 -1014	40.5 .40	42.0 .44	43.0 .48	43.5 .53	43.4 .58	43.0 .61	42.3 .62	41.4 .60	40.8 .57	40.8 .53	41.3 .50	42.6 .49	44.2 .50
44	RA DEC	12 47 -1060	12.0 .21	13.7 .24	14.8 .29	15.4 .34	15.5 .38	15.0 .41	14.3 .42	13.4 .41	12.6 .39	12.5 .35	13.0 .32	14.2 .30	16.0 .31
45	RA DEC	12 53 995	39.1 .59	40.6 .58	41.7 .59	42.2 .62	42.1 .66	41.5 .70	40.8 .71	39.9 .70	39.2 .67	39.0 .63	39.3 .58	40.1 .53	41.5 .49
46	RA DEC	13 23 977	34.5 .16	36.0 .15	37.1 .16	37.7 .19	37.8 .23	37.3 .27	36.6 .28	35.7 .28	35.0 .26	34.6 .22	34.7 .17	35.4 .11	36.7 .07
47	RA DEC	13 24 - 197	43.7 .61	44.8 .64	45.5 .67	46.0 .68	46.2 .69	46.2 .69	46.0 .68	45.6 .67	45.3 .66	45.2 .66	45.4 .66	46.0 .68	47.0 .70
48	RA DEC	13 47 877	11.6 .36	12.9 .34	14.0 .34	14.6 .37	14.8 .41	14.6 .45	14.0 .47	13.2 .48	12.5 .46	12.1 .42	12.1 .37	12.7 .32	13.8 .28
49	RA DEC	14 03 -1072	10.9 .49	12.7 .51	14.2 .54	15.3 .58	15.8 .63	15.8 .66	15.3 .69	14.4 .69	13.5 .67	12.9 .64	13.0 .60	14.0 .58	15.6 .57

Table 10b.(4). Apparent Places of Stars, 1991 (Mils of Declination)—Continued

Star No.	Right ascen- sion Declina- tion MILS	(Hr Min)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
50	RA DEC	14 06 - 645	09.3 .78	10.6 .81	11.5 .84	12.2 .87	12.6 .89	12.7 .92	12.5 .93	12.1 .92	11.6 .91	11.3 .89	11.4 .87	12.0 .86	13.1 .87
51	RA DEC	14 15 341	15.4 .78	16.4 .74	17.3 .73	17.9 .74	18.2 .76	18.2 .78	18.0 .80	17.6 .82	17.1 .81	16.8 .80	16.9 .77	17.3 .73	18.1 .69
52	RA DEC	14 38 -1080	58.8 .82	60.6 .83	62.1 .86	63.4 .90	64.1 .94	64.3 .98	63.9 1.01	63.0 1.01	62.0 1.00	61.2 .97	61.1 .94	61.8 .91	63.3 .89
53	RA DEC	14 50 - 284	22.9 .55	24.0 .57	24.9 .59	25.6 .61	26.1 .62	26.3 .62	26.3 .62	25.9 .61	25.5 .60	25.2 .59	25.2 .59	25.6 .60	26.4 .61
54	RA DEC	14 50 1318	41.3 .85	43.8 .83	46.2 .83	48.1 .86	48.8 .91	48.2 .95	46.7 .99	44.4 1.00	42.0 .98	40.0 .95	39.0 .89	39.2 .84	40.7 .79
55	RA DEC	15 34 475	18.2 .39	19.2 .35	20.1 .34	20.9 .35	21.5 .37	21.7 .41	21.6 .44	21.2 .46	20.7 .46	20.2 .45	19.9 .42	20.1 .38	20.7 .34
56	RA DEC	15 59 - 401	47.9 .73	48.9 .74	49.9 .76	50.8 .77	51.5 .78	51.9 .78	52.1 .79	51.8 .79	51.4 .78	50.9 .77	50.7 .77	50.9 .76	51.6 .77
57	RA DEC	16 28 - 469	51.0 .57	52.0 .58	53.0 .59	54.0 .60	54.8 .60	55.4 .61	55.6 .62	55.4 .62	54.9 .62	54.4 .61	54.1 .60	54.3 .60	54.9 .60
58	RA DEC	16 47 -1226	40.8 .87	42.9 .85	45.1 .84	47.4 .86	49.3 .88	50.6 .92	51.0 .96	50.4 .99	49.0 1.00	47.6 .99	46.5 .96	46.4 .92	47.5 .89
59	RA DEC	17 09 - 279	51.3 .38	52.1 .39	53.0 .40	54.0 .41	54.8 .40	55.4 .40	55.7 .39	55.6 .39	55.3 .38	54.8 .38	54.4 .38	54.4 .38	54.9 .39
60	RA DEC	17 32 - 659	59.4 .53	60.3 .52	61.4 .52	62.5 .53	63.5 .53	64.4 .54	64.8 .55	64.8 .56	64.3 .57	63.8 .57	63.3 .56	63.2 .54	63.6 .53
61	RA DEC	17 34 223	30.5 .36	31.2 .33	32.0 .31	32.9 .31	33.7 .33	34.3 .36	34.6 .39	34.6 .41	34.2 .43	33.6 .43	33.2 .42	33.1 .40	33.4 .36
62	RA DEC	17 56 915	22.1 .33	22.7 .28	23.7 .26	25.0 .25	26.1 .28	26.9 .32	27.1 .37	26.8 .42	26.0 .45	25.0 .45	24.0 .44	23.4 .40	23.5 .35
63	RA DEC	18 23 611	34.1 .39	34.9 .38	35.8 .37	36.9 .37	37.9 .36	38.9 .37	39.5 .37	39.6 .38	39.3 .39	38.7 .39	38.2 .39	37.9 .38	38.2 .37
64	RA DEC	18 36 689	36.9 .31	37.4 .26	38.1 .24	39.1 .23	40.1 .25	41.0 .29	41.4 .34	41.4 .38	40.9 .41	40.2 .43	39.4 .42	39.0 .39	39.0 .34
65	RA DEC	18 54 - 467	42.1 .73	42.7 .72	43.5 .72	44.5 .71	45.5 .70	46.4 .69	47.0 .69	47.3 .69	47.0 .70	46.6 .70	46.0 .70	45.8 .70	45.9 .69
66	RA DEC	19 50 157	20.2 .22	20.5 .20	21.1 .19	21.9 .18	22.8 .20	23.7 .22	24.3 .26	24.6 .29	24.6 .31	24.2 .32	23.7 .32	23.3 .31	23.2 .28
67	RA DEC	20 24 -1009	55.9 .19	56.2 .15	57.0 .12	58.3 .09	59.8 .06	61.4 .06	62.7 .07	63.4 .09	63.3 .12	62.7 .15	61.8 .16	60.9 .15	60.6 .12
68	RA DEC	20 41 804	06.3 .44	06.3 .40	06.7 .37	07.5 .34	08.7 .35	09.8 .37	10.7 .41	11.1 .47	11.0 .52	10.5 .55	09.7 .56	09.0 .55	08.5 .52
69	RA DEC	21 40 -1376	28.8 .60	28.2 .56	28.9 .51	30.9 .46	33.8 .42	37.4 .40	40.5 .41	42.7 .44	43.2 .48	42.1 .52	39.7 .54	37.0 .54	34.9 .51
★ 70	RA DEC	21 43 174	44.5 .84	44.5 .82	44.7 .80	45.2 .80	46.0 .81	47.0 .84	47.9 .87	48.5 .90	48.8 .93	48.6 .95	48.3 .95	47.8 .94	47.6 .93
★ 71	RA DEC	22 07 - 835	40.3 .69	40.2 .66	40.4 .63	41.1 .59	42.1 .56	43.4 .53	44.6 .52	45.5 .52	46.0 .55	45.8 .57	45.3 .60	44.6 .60	44.1 .60
72	RA DEC	22 57 - 527	09.8 .50	09.6 .49	09.6 .47	10.0 .44	10.7 .40	11.7 .37	12.8 .34	13.7 .33	14.2 .34	14.3 .36	14.0 .38	13.5 .39	13.1 .39
73	RA DEC	23 04 269	19.0 .50	18.8 .48	18.8 .46	19.1 .45	19.8 .46	20.7 .48	21.7 .51	22.5 .55	23.0 .58	23.1 .60	22.9 .61	22.5 .61	22.2 .60

Table 10b.(5). Apparent Places of Stars, 1992 (Mils of Declination)

Star No.	Right ascen- sion Declin- ation	(Hr Min) MILS	ZERD HDURS UNIVERSAL TIME (GMT) DF FIRST DAY DF MDNTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	DCT	NDV	DEC	JAN
			Seconds (time of RA or arc of declination)												
1	RA DEC	00 07 516	59.2 .45	58.8 .44	58.6 .41	58.7 .40	59.2 .39	60.2 .40	61.2 .42	62.2 .45	62.9 .49	63.2 .52	63.1 .55	62.9 .56	62.4 .55
2	RA DEC	00 08 1050	45.5 .88	44.6 .87	44.1 .83	44.1 .79	44.9 .76	46.3 .76	47.9 .77	49.4 .80	50.4 .85	50.8 .90	50.6 .95	50.0 .98	49.1 .98
3	RA DEC	00 25 -1374	21.5 .28	18.9 .25	17.4 .21	17.0 .15	17.9 .10	20.1 .05	23.1 .02	26.3 .03	28.6 .05	29.4 .10	28.6 .14	26.5 .17	23.6 .18
4	RA DEC	00 25 - 752	54.4 .92	53.9 .91	53.5 .88	53.5 .84	54.0 .80	54.8 .76	56.0 .73	57.1 .71	57.9 .72	58.3 .75	58.2 .78	57.8 .81	57.2 .82
5	RA DEC	00 40 1004	04.1 .44	03.3 .43	02.7 .40	02.6 .37	03.1 .34	04.4 .32	05.9 .33	07.3 .37	08.4 .41	09.0 .45	09.0 .50	08.6 .53	07.8 .54
6	RA DEC	00 43 - 320	12.4 .54	12.0 .55	11.8 .54	11.8 .52	12.1 .49	12.8 .45	13.8 .42	14.8 .40	15.5 .39	15.9 .40	15.9 .41	15.7 .43	15.3 .45
7	RA DEC	00 56 1078	14.6 .76	13.6 .75	12.9 .72	12.6 .68	13.2 .65	14.5 .63	16.1 .64	17.8 .67	19.0 .71	19.8 .76	19.9 .80	19.5 .84	18.6 .85
8	RA DEC	01 25 1070	19.1 .23	18.1 .23	17.3 .20	16.9 .16	17.3 .13	18.5 .11	20.1 .11	21.7 .13	23.1 .17	24.0 .22	24.4 .26	24.1 .30	23.3 .32
9	RA DEC	01 37 -1018	26.7 .32	25.6 .31	24.8 .29	24.3 .24	24.4 .19	25.1 .14	26.3 .10	27.7 .08	29.0 .09	29.8 .12	29.9 .17	29.5 .21	28.6 .23
10	SEE TABLE 11. APPARENT PLACES OF POLARIS, 1992														
11	RA DEC	02 06 416	45.0 .50	44.6 .50	44.2 .48	43.9 .47	44.0 .46	44.6 .46	45.6 .48	46.6 .50	47.5 .53	48.2 .55	48.6 .57	48.7 .58	48.4 .58
12	RA DEC	02 57 - 716	59.3 1.13	58.7 1.14	58.1 1.14	57.5 1.11	57.3 1.07	57.6 1.02	58.4 .98	59.4 .95	60.5 .94	61.3 .95	61.8 .99	61.8 1.03	61.5 1.07
13	RA DEC	03 01 72	53.5 .18	53.2 .17	52.8 .16	52.4 .16	52.4 .17	52.8 .19	53.5 .21	54.4 .24	55.3 .26	56.0 .26	56.6 .26	56.8 .25	56.7 .24
14	RA DEC	03 23 885	47.8 1.00	47.2 1.01	46.5 1.01	45.8 .99	45.7 .96	46.2 .94	47.2 .92	48.5 .93	49.9 .95	51.0 .97	51.9 1.00	52.3 1.03	52.2 1.05
15	RA DEC	04 35 293	30.1 .24	29.9 .24	29.5 .23	28.9 .23	28.7 .23	28.8 .23	29.4 .24	30.2 .25	31.2 .26	32.1 .27	32.9 .27	33.4 .27	33.6 .26
16	RA DEC	05 14 - 145	11.5 .97	11.4 .99	10.9 1.00	10.4 1.00	10.0 .99	10.0 .97	10.4 .94	11.0 .91	11.9 .90	12.7 .89	13.6 .91	14.1 .93	14.4 .96
17	RA DEC	05 16 817	09.2 .64	09.1 .66	08.5 .67	07.7 .66	07.2 .64	07.2 .62	07.8 .60	08.8 .59	10.0 .59	11.3 .60	12.5 .60	13.3 .62	13.7 .64
18	RA DEC	05 24 112	44.5 .77	44.4 .76	44.1 .75	43.5 .75	43.1 .75	43.1 .76	43.5 .78	44.2 .80	45.1 .80	46.0 .81	46.8 .80	47.4 .79	47.7 .77
19	RA DEC	05 25 508	49.9 .48	49.9 .49	49.5 .49	48.8 .49	48.4 .48	48.4 .47	48.9 .47	49.7 .47	50.7 .47	51.7 .47	52.7 .47	53.4 .48	53.8 .48
20	RA DEC	05 35 - 21	50.8 .45	50.8 .47	50.4 .48	49.8 .48	49.4 .47	49.4 .46	49.7 .44	50.4 .42	51.2 .40	52.1 .40	52.9 .41	53.5 .43	53.9 .45
21	RA DEC	05 40 - 34	23.6 .61	23.6 .62	23.2 .63	22.7 .64	22.3 .63	22.2 .61	22.5 .59	23.2 .57	24.0 .56	24.9 .55	25.7 .57	26.4 .59	26.7 .61
22	RA DEC	05 54 131	46.8 .66	46.8 .65	46.5 .64	45.9 .64	45.5 .65	45.4 .65	45.7 .67	46.4 .68	47.2 .69	48.1 .69	49.0 .68	49.7 .67	50.1 .65
23	RA DEC	06 23 - 936	49.2 .74	49.0 .79	48.2 .82	47.1 .82	46.1 .81	45.5 .78	45.4 .74	45.9 .69	46.9 .65	48.1 .65	49.3 .67	50.2 .71	50.6 .77
24	RA DEC	06 37 291	17.6 .66	17.8 .66	17.5 .66	17.0 .66	16.5 .66	16.3 .66	16.5 .66	17.1 .67	17.9 .67	18.8 .66	19.7 .66	20.6 .64	21.1 .63
25	RA DEC	06 44 - 296	50.1 .98	50.2 1.02	49.9 1.04	49.3 1.04	48.8 1.04	48.5 1.02	48.6 .99	49.1 .96	49.7 .94	50.6 .93	51.5 .95	52.3 .98	52.8 1.02

Table 10b.(5). Apparent Places of Stars, 1992 (Mils of Declination)—Continued

Star No.	Right Ascension Declination	(Hr Min) MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
26	RA DEC	06 58 - 514	21.1 .86	21.1 .91	20.8 .93	20.1 .95	19.5 .94	19.1 .92	19.2 .88	19.6 .84	20.2 .81	21.1 .81	22.1 .82	22.9 .86	23.5 .90
27	RA DEC	07 08 - 468	06.3 .99	06.4 1.03	06.1 1.06	05.5 1.07	04.9 1.06	04.5 1.04	04.5 1.01	04.9 .97	05.6 .94	06.4 .94	07.4 .95	08.2 .98	08.8 1.03
28	RA DEC	07 34 567	08.3 .20	08.7 .20	08.5 .21	08.0 .22	07.4 .22	07.1 .22	07.1 .21	07.5 .20	08.3 .19	09.2 .17	10.3 .16	11.3 .15	12.1 .15
29	RA DEC	07 38 93	55.4 .24	55.8 .22	55.6 .21	55.1 .21	54.6 .21	54.4 .22	54.4 .23	54.7 .24	55.3 .25	56.1 .24	57.0 .23	57.9 .20	58.6 .18
30	RA DEC	07 44 498	52.4 .56	52.8 .57	52.7 .58	52.2 .58	51.6 .59	51.3 .58	51.3 .58	51.7 .57	52.3 .55	53.2 .54	54.3 .52	55.3 .51	56.1 .51
31	RA DEC	08 09 - 841	19.7 .11	19.9 .16	19.6 .20	18.9 .23	18.0 .24	17.3 .22	17.0 .19	17.0 .15	17.6 .11	18.5 .09	19.7 .09	20.8 .12	21.6 .17
32	RA DEC	08 22 -1057	23.9 .47	24.2 .53	23.7 .58	22.7 .60	21.5 .62	20.4 .60	19.8 .58	19.7 .53	20.2 .48	21.3 .46	22.8 .46	24.3 .49	25.3 .54
33	RA DEC	09 07 - 771	44.3 .54	44.9 .60	44.8 .64	44.3 .67	43.6 .69	43.0 .68	42.6 .66	42.5 .62	42.7 .58	43.5 .56	44.5 .55	45.7 .58	46.7 .62
34	RA DEC	09 13 -1238	10.2 .80	11.0 .85	10.7 .91	09.4 .95	07.7 .97	06.0 .97	04.7 .95	04.0 .91	04.3 .86	05.5 .83	07.5 .81	09.6 .83	11.7 .87
35	RA DEC	09 27 - 153	13.7 .33	14.3 .36	14.4 .39	14.2 .40	13.8 .40	13.4 .40	13.2 .38	13.2 .36	13.4 .35	14.0 .34	14.8 .36	15.8 .38	16.7 .42
36	RA DEC	10 07 213	58.8 .40	59.5 .38	59.8 .37	59.7 .38	59.3 .38	58.9 .39	58.7 .40	58.6 .40	58.8 .40	59.2 .38	60.0 .36	61.0 .33	61.9 .30
37	RA DEC	11 01 1002	24.1 1.00	25.4 1.01	26.1 1.04	26.0 1.08	25.4 1.11	24.5 1.12	23.8 1.12	23.3 1.09	23.2 1.05	23.5 1.00	24.5 .96	25.9 .92	27.4 .90
38	RA DEC	11 03 1098	16.9 .44	18.4 .45	19.2 .49	19.1 .53	18.3 .56	17.3 .57	16.3 .57	15.7 .54	15.5 .49	15.9 .44	16.9 .40	18.5 .36	20.3 .35
39	RA DEC	11 48 259	40.5 .79	41.5 .76	42.0 .76	42.2 .76	42.1 .78	41.8 .79	41.5 .80	41.2 .80	41.0 .80	41.2 .78	41.7 .75	42.5 .72	43.5 .69
40	RA DEC	11 53 955	26.3 .24	27.7 .24	28.6 .26	28.8 .30	28.4 .34	27.7 .36	27.0 .36	26.3 .35	26.0 .31	26.0 .26	26.7 .21	27.8 .17	29.3 .15
41	RA DEC	12 15 - 311	24.8 .08	25.8 .12	26.4 .15	26.7 .17	26.7 .18	26.4 .18	26.1 .18	25.8 .16	25.6 .15	25.7 .14	26.1 .13	26.9 .15	28.0 .18
42	RA DEC	12 26 -1120	10.2 .92	11.9 .96	13.1 1.00	13.6 1.06	13.4 1.10	12.8 1.13	11.8 1.14	10.8 1.13	10.0 1.10	09.9 1.06	10.7 1.02	12.1 1.01	14.0 1.02
43	RA DEC	12 30 -1014	44.2 .50	45.8 .54	46.8 .59	47.2 .64	47.2 .68	46.7 .71	46.0 .72	45.2 .70	44.5 .67	44.5 .63	45.1 .60	46.3 .59	47.9 .60
44	RA DEC	12 47 -1060	16.0 .31	17.7 .34	18.8 .39	19.4 .43	19.4 .48	19.0 .51	18.2 .52	17.3 .51	16.6 .48	16.4 .44	16.9 .41	18.2 .40	19.9 .40
45	RA DEC	12 53 995	41.5 .49	43.1 .48	44.1 .49	44.7 .53	44.5 .57	43.9 .60	43.1 .61	42.3 .61	41.6 .58	41.3 .54	41.6 .48	42.5 .43	43.9 .40
46	RA DEC	13 23 976	36.7 1.07	38.2 1.06	39.3 1.07	40.0 1.10	40.0 1.14	39.5 1.18	38.8 1.20	37.9 1.20	37.1 1.17	36.7 1.13	36.8 1.08	37.6 1.02	38.9 .98
47	RA DEC	13 24 - 197	47.0 .70	48.1 .74	48.8 .76	49.3 .78	49.5 .78	49.5 .78	49.2 .77	48.9 .76	48.5 .75	48.4 .75	48.7 .75	49.3 .77	50.3 .79
48	RA DEC	13 47 877	13.8 .28	15.1 .25	16.2 .26	16.9 .29	17.0 .33	16.7 .37	16.2 .39	15.4 .39	14.7 .38	14.3 .34	14.3 .29	14.9 .24	16.0 .20
49	RA DEC	14 03 -1072	15.6 .57	17.5 .59	18.9 .62	20.0 .66	20.5 .71	20.5 .74	20.0 .77	19.1 .77	18.1 .75	17.6 .72	17.7 .68	18.6 .66	20.2 .65

Table 10b.(5). Apparent Places of Stars, 1992 (Mils of Declination)—Continued

Star No.	Right ascen- sion Declina- tion	(Hr Min) MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
50	RA DEC	14 06 - 645	13.1 .87	14.3 .89	15.3 .92	16.1 .95	16.4 .98	16.5 1.00	16.3 1.00	15.8 1.00	15.3 .99	15.0 .97	15.1 .95	15.7 .94	16.8 .95
51	RA DEC	14 15 341	18.1 .69	19.2 .66	20.0 .64	20.7 .65	20.9 .67	20.9 .70	20.7 .72	20.3 .73	19.9 .73	19.5 .71	19.6 .68	20.0 .64	20.9 .60
52	RA DEC	14 39 -1080	03.3 .89	05.1 .90	06.7 .93	08.0 .97	08.7 1.01	08.8 1.04	08.4 1.07	07.5 1.08	06.4 1.07	05.7 1.04	05.6 1.00	06.3 .97	07.7 .96
53	RA DEC	14 50 - 284	26.4 .61	27.5 .64	28.4 .66	29.1 .68	29.6 .68	29.8 .68	29.7 .68	29.4 .67	28.9 .67	28.6 .66	28.6 .65	29.0 .66	29.8 .68
54	RA DEC	14 50 1318	40.7 .79	43.2 .76	45.6 .77	47.5 .80	48.2 .84	47.5 .89	45.9 .92	43.7 .93	41.3 .92	39.3 .88	38.3 .83	38.5 .78	40.1 .73
55	RA DEC	15 34 475	20.7 .34	21.7 .30	22.7 .29	23.5 .30	24.0 .32	24.2 .36	24.2 .39	23.8 .41	23.2 .42	22.7 .40	22.4 .37	22.6 .33	23.3 .29
56	RA DEC	15 59 - 401	51.6 .77	52.6 .78	53.6 .80	54.5 .81	55.2 .82	55.6 .82	55.7 .82	55.5 .82	55.0 .82	54.5 .81	54.3 .80	54.5 .80	55.2 .81
57	RA DEC	16 28 - 469	54.9 .60	55.9 .60	56.9 .61	57.9 .62	58.6 .63	59.2 .64	59.4 .64	59.2 .64	58.7 .64	58.2 .63	57.9 .62	58.0 .62	58.6 .62
58	RA DEC	16 47 -1226	47.5 .89	49.6 .86	51.9 .86	54.2 .88	56.1 .90	57.3 .94	57.7 .98	57.0 1.01	55.6 1.02	54.1 1.01	53.1 .98	53.1 .94	54.2 .90
59	RA DEC	17 09 - 279	54.9 .39	55.7 .40	56.6 .41	57.6 .42	58.3 .41	59.0 .41	59.3 .40	59.2 .40	58.8 .39	58.3 .39	57.9 .39	57.9 .39	58.3 .40
60	RA DEC	17 33 - 659	03.6 .53	04.6 .52	05.6 .52	06.8 .52	07.8 .53	08.6 .54	09.0 .55	09.0 .56	08.5 .57	07.9 .57	07.4 .55	07.3 .54	07.7 .53
61	RA DEC	17 34 223	33.4 .36	34.1 .33	34.9 .31	35.8 .31	36.6 .33	37.2 .36	37.5 .39	37.4 .41	37.0 .43	36.4 .43	36.0 .42	35.9 .40	36.2 .37
62	RA DEC	17 56 915	23.5 .35	24.2 .30	25.2 .27	26.5 .27	27.5 .29	28.3 .34	28.5 .39	28.2 .43	27.4 .46	26.3 .47	25.4 .45	24.8 .41	24.9 .36
63	RA DEC	18 23 - 611	38.2 .37	39.0 .35	39.9 .35	41.0 .34	42.0 .34	42.9 .34	43.5 .35	43.7 .36	43.3 .37	42.7 .37	42.2 .36	41.9 .35	42.2 .34
64	RA DEC	18 36 689	39.0 .34	39.5 .30	40.3 .27	41.3 .26	42.3 .28	43.1 .32	43.5 .37	43.5 .41	43.0 .45	42.2 .46	41.5 .45	41.0 .42	41.0 .37
65	RA DEC	18 54 - 467	45.9 .69	46.5 .68	47.3 .68	48.3 .67	49.3 .66	50.2 .65	50.8 .65	51.1 .65	50.8 .66	50.3 .66	49.8 .66	49.5 .66	49.6 .65
66	RA DEC	19 50 157	23.2 .28	23.6 .26	24.1 .25	24.9 .24	25.8 .26	26.7 .29	27.4 .32	27.7 .35	27.5 .37	27.1 .38	26.6 .38	26.3 .37	26.2 .35
67	RA DEC	20 25 -1008	0 .6 1.12	0 .9 1.08	01.8 1.04	03.0 1.01	04.5 .99	06.1 .99	07.3 1.00	08.0 1.02	07.9 1.05	07.3 1.07	06.3 1.08	05.5 1.07	05.1 1.05
68	RA DEC	20 41 804	08.5 .52	08.5 .48	09.0 .44	09.8 .42	10.9 .42	12.1 .45	12.9 .49	13.4 .55	13.2 .59	12.7 .63	11.9 .64	11.2 .63	10.7 .60
69	RA DEC	21 40 -1376	34.9 .51	34.2 .46	34.9 .41	37.0 .37	39.9 .33	43.3 .32	46.5 .32	48.6 .35	49.1 .40	47.9 .43	45.5 .45	42.8 .45	40.6 .42
★70	RA DEC	21 43 174	47.6 .93	47.6 .91	47.8 .90	48.3 .89	49.1 .90	50.1 .93	51.0 .96	51.6 1.00	51.8 1.02	51.6 1.04	51.3 1.04	50.8 1.04	50.5 1.02
★71	RA DEC	22 07 - 835	44.1 .60	43.9 .57	44.1 .53	44.8 .49	45.8 .46	47.0 .43	48.3 .42	49.2 .43	49.6 .45	49.4 .48	48.9 .50	48.2 .51	47.6 .50
72	RA DEC	22 57 - 527	13.1 .39	12.9 .38	13.0 .36	13.3 .33	14.0 .30	15.0 .26	16.1 .24	17.0 .23	17.4 .24	17.5 .25	17.2 .28	16.8 .29	16.3 .29
73	RA DEC	23 04 269	22.2 .60	22.0 .58	22.0 .57	22.3 .56	22.9 .56	23.8 .58	24.8 .61	25.6 .65	26.1 .68	26.2 .70	25.9 .71	25.6 .71	25.2 .70

Table 11a. Apparent Places of Polaris (Star No 10), 1988

	DECLINATION				RIGHT ASCENSION		
	DEG	MIN	SEC	MILS	HR	MIN	SEC
JAN 00	89	13	01	1586.07	02	19	28
10	89	13	03	1586.08	02	19	14
20	89	13	04	1586.09	02	19	00
30	89	13	04	1586.09	02	18	45
FEB 00	89	13	04	1586.09	02	18	45
10	89	13	04	1586.09	02	18	27
20	89	13	04	1586.09	02	18	12
30	89	13	2	1586.08	02	18	00
MAR 00	89	13	02	1586.08	02	18	00
10	89	13	00	1586.07	02	17	48
20	89	12	58	1586.06	02	17	37
30	89	12	55	1586.04	02	17	31
APR 00	89	12	55	1586.04	02	17	30
10	89	12	52	1586.03	02	17	27
20	89	12	49	1586.01	02	17	25
30	89	12	46	1586.00	02	17	26
MAY 00	89	12	46	1586.00	02	17	26
10	89	12	43	1585.99	02	17	32
20	89	12	40	1585.97	02	17	40
30	89	12	38	1585.96	02	17	49
JUN 00	89	12	38	1585.96	02	17	50
10	89	12	36	1585.95	02	18	02
20	89	12	34	1585.94	02	18	16
30	89	12	33	1585.94	02	18	32
JUL 00	89	12	33	1585.94	02	18	32
10	89	12	33	1585.94	02	18	48
20	89	12	33	1585.94	02	19	04
30	89	12	34	1585.94	02	19	21
AUG 00	89	12	34	1585.94	02	19	23
10	89	12	35	1585.95	02	19	40
20	89	12	37	1585.96	02	19	55
30	89	12	39	1585.97	02	20	10
SEP 00	89	12	39	1585.97	02	20	12
10	89	12	42	1585.98	02	20	26
20	89	12	45	1586.00	02	20	39
30	89	12	48	1586.01	02	20	50
OCT 00	89	12	48	1586.01	02	20	50
10	89	12	51	1586.02	02	20	58
20	89	12	55	1586.04	02	21	05
30	89	12	59	1586.06	02	21	10
NOV 00	89	12	59	1586.06	02	21	10
10	89	13	03	1586.08	02	21	10
20	89	13	07	1586.10	02	21	08
30	89	13	10	1586.12	02	21	05
DEC 00	89	13	10	1586.12	02	21	05
10	89	13	13	1586.13	02	20	58
20	89	13	16	1586.15	02	20	48
30	89	13	19	1586.16	02	20	36

Table 11b. Apparent Places of Polaris (Star No 10), 1989

	DECLINATION				RIGHT ASCENSION		
	DEG	MIN	SEC	MILS	HR	MIN	SEC
JAN 00	89	13	19	1586.16	02	20	35
10	89	13	21	1586.17	02	20	22
20	89	13	22	1586.18	02	20	08
30	89	13	22	1586.18	02	19	51
FEB 00	89	13	22	1586.18	02	19	51
10	89	13	22	1586.18	02	19	34
20	89	13	21	1586.17	02	19	20
30	89	13	20	1586.17	02	19	09
MAR 00	89	13	20	1586.17	02	19	09
10	89	13	18	1586.16	02	18	56
20	89	13	16	1586.15	02	18	47
30	89	13	13	1586.13	02	18	40
APR 00	89	13	13	1586.13	02	18	39
10	89	13	10	1586.12	02	18	35
20	89	13	07	1586.10	02	18	33
30	89	13	04	1586.09	02	18	35
MAY 00	89	13	04	1586.09	02	18	35
10	89	13	01	1586.07	02	18	41
20	89	12	58	1586.06	02	18	47
30	89	12	56	1586.05	02	18	57
JUN 00	89	12	55	1586.04	02	18	58
10	89	12	54	1586.04	02	19	11
20	89	12	52	1586.03	02	19	25
30	89	12	51	1586.02	02	19	40
JUL 00	89	12	51	1586.02	02	19	40
10	89	12	51	1586.02	02	19	56
20	89	12	51	1586.02	02	20	14
30	89	12	51	1586.02	02	20	31
AUG 00	89	12	51	1586.02	02	20	33
10	89	12	52	1586.03	02	20	49
20	89	12	54	1586.04	02	21	05
30	89	12	56	1586.05	02	21	21
SEP 00	89	12	56	1586.05	02	21	23
10	89	12	59	1586.06	02	21	37
20	89	13	02	1586.08	02	21	50
30	89	13	05	1586.09	02	22	00
OCT 00	89	13	05	1586.09	02	22	00
10	89	13	09	1586.11	02	22	10
20	89	13	12	1586.13	02	22	17
30	89	13	16	1586.15	02	22	20
NOV 00	89	13	16	1586.15	02	22	21
10	89	13	20	1586.17	02	22	22
20	89	13	24	1586.19	02	22	21
30	89	13	27	1586.20	02	22	17
DEC 00	89	13	27	1586.20	02	22	17
10	89	13	30	1586.22	02	22	10
20	89	13	33	1586.23	02	22	01
30	89	13	36	1586.25	02	21	50

Table 11c. Apparent Places of Polaris (Star No 10), 1990

	DECLINATION				RIGHT ASCENSION		
	DEG	MIN	SEC	MILS	HR	MIN	SEC
JAN 00	89	13	36	1586.25	02	21	49
10	89	13	38	1586.26	02	21	35
20	89	13	39	1586.26	02	21	20
30	89	13	39	1586.26	02	21	04
FEB 00	89	13	39	1586.26	02	21	04
10	89	13	39	1586.26	02	20	48
20	89	13	38	1586.26	02	20	33
30	89	13	37	1586.25	02	20	21
MAR 00	89	13	37	1586.25	02	20	21
10	89	13	35	1586.24	02	20	09
20	89	13	33	1586.23	02	20	00
30	89	13	30	1586.22	02	19	52
APR 00	89	13	30	1586.22	02	19	51
10	89	13	27	1586.20	02	19	46
20	89	13	24	1586.19	02	19	46
30	89	13	21	1586.17	02	19	48
MAY 00	89	13	21	1586.17	02	19	48
10	89	13	18	1586.16	02	19	52
20	89	13	15	1586.14	02	19	59
30	89	13	13	1586.13	02	20	10
JUN 00	89	13	12	1586.13	02	20	11
10	89	13	10	1586.12	02	20	23
20	89	13	09	1586.11	02	20	37
30	89	13	08	1586.11	02	20	52
JUL 00	89	13	08	1586.11	02	20	52
10	89	13	07	1586.10	02	21	09
20	89	13	07	1586.10	02	21	26
30	89	13	08	1586.11	02	21	43
AUG 00	89	13	08	1586.11	02	21	45
10	89	13	09	1586.11	02	22	01
20	89	13	11	1586.12	02	22	19
30	89	13	12	1586.13	02	22	34
SEP 00	89	13	13	1586.13	02	22	36
10	89	13	15	1586.14	02	22	50
20	89	13	18	1586.16	02	23	03
30	89	13	21	1586.17	02	23	14
OCT 00	89	13	21	1586.17	02	23	14
10	89	13	25	1586.19	02	23	24
20	89	13	28	1586.21	02	23	30
30	89	13	32	1586.23	02	23	34
NOV 00	89	13	32	1586.23	02	23	35
10	89	13	36	1586.25	02	23	37
20	89	13	40	1586.27	02	23	36
30	89	13	43	1586.28	02	23	31
DEC 00	89	13	43	1586.28	02	23	31
10	89	13	47	1586.30	02	23	25
20	89	13	49	1586.31	02	23	17
30	89	13	52	1586.33	02	23	05

Table 11d. Apparent Places of Polaris (Star No 10), 1991

	DECLINATION				RIGHT ASCENSION		
	DEG	MIN	SEC	MILS	HR	MIN	SEC
JAN 00	89	13	52	1586.33	02	23	04
10	89	13	54	1586.34	02	22	50
20	89	13	55	1586.34	02	22	35
30	89	13	55	1586.34	02	22	20
FEB 00	89	13	55	1586.34	02	22	20
10	89	13	55	1586.34	02	22	03
20	89	13	54	1586.34	02	21	47
30	89	13	53	1586.33	02	21	37
MAR 00	89	13	53	1586.33	02	21	37
10	89	13	51	1586.32	02	21	25
20	89	13	49	1586.31	02	21	14
30	89	13	46	1586.30	02	21	06
APR 00	89	13	46	1586.30	02	21	05
10	89	13	43	1586.28	02	21	01
20	89	13	40	1586.27	02	21	00
30	89	13	36	1586.25	02	21	01
MAY 00	89	13	36	1586.25	02	21	01
10	89	13	34	1586.24	02	21	05
20	89	13	31	1586.22	02	21	14
30	89	13	28	1586.21	02	21	24
JUN 00	89	13	28	1586.21	02	21	25
10	89	13	26	1586.20	02	21	36
20	89	13	25	1586.19	02	21	50
30	89	13	23	1586.18	02	22	06
JUL 00	89	13	23	1586.18	02	22	06
10	89	13	23	1586.18	02	22	23
20	89	13	23	1586.18	02	22	40
30	89	13	23	1586.18	02	22	57
AUG 00	89	13	23	1586.18	02	22	58
10	89	13	24	1586.19	02	23	16
20	89	13	26	1586.20	02	23	33
30	89	13	28	1586.21	02	23	48
SEP 00	89	13	28	1586.21	02	23	50
10	89	13	31	1586.22	02	24	04
20	89	13	34	1586.24	02	24	18
30	89	13	36	1586.25	02	24	30
OCT 00	89	13	36	1586.25	02	24	30
10	89	13	40	1586.27	02	24	39
20	89	13	44	1586.29	02	24	45
30	89	13	47	1586.30	02	24	51
NOV 00	89	13	48	1586.31	02	24	51
10	89	13	51	1586.32	02	24	53
20	89	13	55	1586.34	02	24	51
30	89	13	58	1586.36	02	24	48
DEC 00	89	13	58	1586.36	02	24	48
10	89	14	02	1586.38	02	24	42
20	89	14	04	1586.39	02	24	33
30	89	14	07	1586.40	02	24	21

Table 11e. Apparent Places of Polaris (Star No 10), 1992

	DECLINATION				RIGHT ASCENSION		
	DEG	MIN	SEC	MILS	HR	MIN	SEC
JAN 00	89	14	07	1586.40	02	24	20
10	89	14	09	1586.41	02	24	06
20	89	14	10	1586.41	02	23	52
30	89	14	10	1586.41	02	23	37
FEB 00	89	14	10	1586.41	02	23	37
10	89	14	10	1586.41	02	23	18
20	89	14	10	1586.41	02	23	03
30	89	14	8	1586.40	02	22	53
MAR 00	89	14	08	1586.40	02	22	53
10	89	14	06	1586.40	02	22	38
20	89	14	04	1586.39	02	22	28
30	89	14	01	1586.37	02	22	21
APR 00	89	14	01	1586.37	02	22	20
10	89	13	58	1586.36	02	22	16
20	89	13	54	1586.34	02	22	15
30	89	13	51	1586.32	02	22	16
MAY 00	89	13	51	1586.32	02	22	16
10	89	13	48	1586.31	02	22	21
20	89	13	46	1586.30	02	22	29
30	89	13	43	1586.28	02	22	38
JUN 00	89	13	43	1586.28	02	22	39
10	89	13	41	1586.27	02	22	52
20	89	13	39	1586.26	02	23	06
30	89	13	38	1586.26	02	23	22
JUL 00	89	13	38	1586.26	02	23	22
10	89	13	38	1586.26	02	23	38
20	89	13	38	1586.26	02	23	55
30	89	13	38	1586.26	02	24	13
AUG 00	89	13	38	1586.26	02	24	15
10	89	13	39	1586.26	02	24	32
20	89	13	41	1586.27	02	24	48
30	89	13	43	1586.28	02	25	04
SEP 00	89	13	43	1586.28	02	25	06
10	89	13	45	1586.29	02	25	21
20	89	13	48	1586.31	02	25	34
30	89	13	51	1586.32	02	25	45
OCT 00	89	13	51	1586.32	02	25	45
10	89	13	55	1586.34	02	25	54
20	89	13	58	1586.36	02	26	02
30	89	14	02	1586.38	02	26	07
NOV 00	89	14	02	1586.38	02	26	07
10	89	14	06	1586.40	02	26	08
20	89	14	10	1586.41	02	26	07
30	89	14	13	1586.43	02	26	03
DEC 00	89	14	13	1586.43	02	26	03
10	89	14	16	1586.44	02	25	57
20	89	14	19	1586.46	02	25	47
30	89	14	21	1586.47	02	25	35

Table 12a. To Determine Azimuth From Polaris, 1988

L.S.T.	0 ^h	1 ^h	2 ^h	3 ^h	4 ^h	5 ^h	6 ^h	7 ^h	8 ^h	9 ^h	10 ^h	11 ^h
	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀
M	°	°	°	°	°	°	°	°	°	°	°	°
0	+27.3	+16.2	+ 4.0	- 8.5	-20.3	-30.8	-39.0	-44.6	-47.0	-46.2	-42.3	-35.6
3	26.7	15.6	3.4	9.1	20.9	31.2	39.4	44.8	47.0	46.1	42.1	35.2
6	26.2	15.0	2.8	9.7	21.5	31.7	39.7	44.9	47.1	46.0	41.8	34.8
9	25.7	14.4	2.2	10.3	22.0	32.2	40.0	45.1	47.1	45.8	41.5	34.4
12	25.2	13.8	1.5	10.9	22.6	32.6	40.4	45.3	47.1	45.7	41.2	34.0
15	+24.7	+13.2	+ 0.9	-11.5	-23.1	-33.1	-40.7	-45.5	-47.1	-45.5	-40.9	-33.5
18	24.1	12.6	+ 0.3	12.1	23.6	33.5	41.0	45.6	47.1	45.4	40.6	33.1
21	23.6	12.0	- 0.4	12.7	24.2	33.9	41.3	45.8	47.1	45.2	40.3	32.7
24	23.0	11.4	1.0	13.3	24.7	34.4	41.6	45.9	47.1	45.0	40.0	32.2
27	22.5	10.8	1.6	13.9	25.3	34.8	41.9	46.0	47.0	44.8	39.6	31.8
30	+21.9	+10.2	- 2.2	-14.5	-25.8	-35.2	-42.2	-46.2	-47.0	-44.7	-39.3	-31.3
33	21.4	9.6	2.9	15.1	26.3	35.6	42.4	46.3	47.0	44.5	39.0	30.9
36	20.8	9.0	3.5	15.7	26.8	36.0	42.7	46.4	46.9	44.2	38.6	30.4
39	20.3	8.4	4.1	16.3	27.3	36.4	43.0	46.5	46.9	44.0	38.3	29.9
42	19.7	7.8	4.7	16.9	27.8	36.8	43.2	46.6	46.8	43.8	37.9	29.5
45	+19.1	+ 7.1	- 5.4	-17.5	-28.3	-37.2	-43.5	-46.7	-46.7	-43.6	-37.5	-29.0
48	18.5	6.5	6.0	18.0	28.8	37.6	43.7	46.8	46.6	43.3	37.2	28.5
51	18.0	5.9	6.6	18.6	29.3	37.9	43.9	46.8	46.5	43.1	36.8	28.0
54	17.4	5.3	7.2	19.2	29.8	38.3	44.1	46.9	46.4	42.9	36.4	27.5
57	16.8	4.7	7.8	19.8	30.3	38.7	44.3	47.0	46.3	42.6	36.0	27.0
60	+16.2	+ 4.0	- 8.5	-20.3	-30.8	-39.0	-44.6	-47.0	-46.2	-42.3	-35.6	-26.5
LAT	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁
	°	°	°	°	°	°	°	°	°	°	°	°
0	- .3	- .2	.0	+ .2	+ .3	+ .4	+ .3	+ .2	.0	- .2	- .3	- .4
10	- .3	- .1	.0	+ .2	+ .3	+ .3	+ .3	+ .1	.0	- .2	- .3	- .3
20	- .2	- .1	.0	+ .2	+ .2	+ .3	+ .2	+ .1	.0	- .2	- .2	- .3
30	- .2	- .1	.0	+ .1	+ .2	+ .2	+ .2	+ .1	.0	- .1	- .2	- .2
40	- .1	.0	.0	+ .1	+ .1	+ .1	+ .1	.0	.0	- .1	- .1	- .1
45	- .1	.0	.0	.0	+ .1	+ .1	+ .1	.0	.0	.0	- .1	- .1
50	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
55	+ .1	.0	.0	.0	- .1	- .1	- .1	.0	.0	.0	+ .1	+ .1
60	+ .1	+ .1	.0	- .1	- .2	- .2	- .1	- .1	.0	+ .1	+ .2	+ .2
62	+ .2	+ .1	.0	- .1	- .2	- .2	- .2	- .1	.0	+ .1	+ .2	+ .2
64	+ .2	+ .1	.0	- .2	- .3	- .3	- .2	- .1	.0	+ .2	+ .3	+ .3
66	+ .3	+ .1	.0	- .2	- .3	- .3	- .3	- .1	.0	+ .2	+ .3	+ .3
MONTH	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂
	°	°	°	°	°	°	°	°	°	°	°	°
Jan.	- .1	- .1	.0	.0	.0	+ .1	+ .1	+ .1	+ .1	+ .2	+ .1	+ .1
Feb.	- .2	- .2	- .2	- .1	- .1	.0	.0	+ .1	+ .2	+ .2	+ .2	+ .2
Mar.	- .3	- .3	- .3	- .3	- .2	- .2	- .1	.0	+ .1	+ .2	+ .2	+ .3
Apr.	- .3	- .4	- .4	- .4	- .4	- .3	- .2	- .1	.0	+ .1	+ .1	+ .2
May	- .2	- .3	- .3	- .4	- .4	- .4	- .3	- .3	- .2	- .1	.0	+ .1
June	- .1	- .2	- .2	- .3	- .4	- .4	- .4	- .4	- .3	- .2	- .1	.0
July	+ .1	.0	- .1	- .2	- .2	- .3	- .3	- .3	- .3	- .3	- .2	- .2
Aug.	+ .2	+ .2	+ .1	.0	- .1	- .1	- .2	- .3	- .3	- .3	- .3	- .3
Sept.	+ .3	+ .3	+ .2	+ .2	+ .1	.0	.0	- .1	- .2	- .2	- .3	- .3
Oct.	+ .3	+ .3	+ .4	+ .3	+ .3	+ .2	+ .2	+ .1	.0	- .1	- .2	- .3
Nov.	+ .2	+ .3	+ .4	+ .4	+ .4	+ .4	+ .3	+ .3	+ .2	+ .1	.0	- .2
Dec.	+ .1	+ .2	+ .3	+ .4	+ .5	+ .5	+ .5	+ .4	+ .3	+ .2	+ .1	.0

(B0 + B1 + B2)

AZIMUTH OF POLARIS -----
COS LATITUDE

Table 12a. To Determine Azimuth From Polaris, 1988—Continued

L.S.T.	12 ^h	13 ^h	14 ^h	15 ^h	16 ^h	17 ^h	18 ^h	19 ^h	20 ^h	21 ^h	22 ^h	23 ^h
	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀
M	•	•	•	•	•	•	•	•	•	•	•	•
0	-26.5	-15.7	- 3.9	+ 8.2	+19.7	+30.0	+38.3	+44.1	+46.9	+46.5	+42.9	+36.4
3	26.0	15.2	3.3	8.8	20.3	30.5	38.7	44.3	46.9	46.4	42.7	36.0
6	25.5	14.6	2.7	9.4	20.8	30.9	39.0	44.5	47.0	46.3	42.4	35.6
9	25.0	14.0	2.1	10.0	21.4	31.4	39.3	44.7	47.0	46.2	42.1	35.2
12	24.5	13.4	1.5	10.6	21.9	31.8	39.7	44.9	47.1	46.0	41.8	34.7
15	-24.0	-12.8	- 0.9	+11.2	+22.5	+32.3	+40.0	+45.1	+47.1	+45.9	+41.6	+34.3
18	23.4	12.3	- 0.3	11.7	23.0	32.7	40.3	45.2	47.1	45.8	41.3	33.9
21	22.9	11.7	+ 0.3	12.3	23.5	33.2	40.6	45.4	47.1	45.6	41.0	33.4
24	22.4	11.1	0.9	12.9	24.0	33.6	40.9	45.6	47.1	45.4	40.6	33.0
27	21.8	10.5	1.6	13.5	24.6	34.0	41.2	45.7	47.1	45.3	40.3	32.6
30	-21.3	- 9.9	+ 2.2	+14.1	+25.1	+34.4	+41.5	+45.9	+47.1	+45.1	+40.0	+32.1
33	20.8	9.3	2.8	14.7	25.6	34.9	41.8	46.0	47.1	44.9	39.7	31.6
36	20.2	8.7	3.4	15.2	26.1	35.3	42.1	46.1	47.0	44.7	39.3	31.2
39	19.7	8.1	4.0	15.8	26.6	35.7	42.4	46.2	47.0	44.5	39.0	30.7
42	19.1	7.5	4.6	16.4	27.1	36.1	42.6	46.4	46.9	44.3	38.6	30.2
45	-18.6	- 6.9	+ 5.2	+16.9	+27.6	+36.4	+42.9	+46.5	+46.9	+44.1	+38.3	+29.7
48	18.0	6.3	5.8	17.5	28.1	36.8	43.1	46.6	46.8	43.9	37.9	29.3
51	17.4	5.7	6.4	18.1	28.6	37.2	43.4	46.6	46.8	43.7	37.5	28.8
54	16.9	5.1	7.0	18.6	29.1	37.6	43.6	46.7	46.7	43.4	37.1	28.3
57	16.3	4.5	7.6	19.2	29.5	37.9	43.8	46.8	46.6	43.2	36.8	27.8
60	-15.7	- 3.9	+ 8.2	+19.7	+30.0	+38.3	+44.1	+46.9	+46.5	+42.9	+36.4	+27.3
LAT	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁
0	•	•	•	•	•	•	•	•	•	•	•	•
10	- .3	- .2	.0	+ .2	+ .3	+ .4	+ .3	+ .2	.0	- .2	- .3	- .4
20	- .3	- .1	.0	+ .2	+ .3	+ .3	+ .3	+ .1	.0	- .2	- .3	- .3
30	- .2	- .1	.0	+ .1	+ .2	+ .2	+ .2	+ .1	.0	- .1	- .2	- .2
40	- .1	.0	.0	+ .1	+ .1	+ .1	+ .1	.0	.0	- .1	- .1	- .1
45	- .1	.0	.0	.0	+ .1	+ .1	+ .1	.0	.0	.0	- .1	- .1
50	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
55	+ .1	.0	.0	.0	- .1	- .1	- .1	.0	.0	.0	+ .1	+ .1
60	+ .1	+ .1	.0	- .1	- .2	- .2	- .1	- .1	.0	+ .1	+ .2	+ .2
62	+ .2	+ .1	.0	- .1	- .2	- .2	- .2	- .1	.0	+ .1	+ .2	+ .2
64	+ .2	+ .1	.0	- .2	- .3	- .3	- .2	- .1	.0	+ .2	+ .3	+ .3
66	+ .3	+ .1	.0	- .2	- .3	- .3	- .3	- .1	.0	+ .2	+ .3	+ .3
MONTH	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂
Jan.	•	•	•	•	•	•	•	•	•	•	•	•
Feb.	+ .1	+ .1	.0	.0	.0	- .1	- .1	- .1	- .1	- .2	- .1	- .1
Mar.	+ .2	+ .2	+ .2	+ .1	+ .1	.0	.0	- .1	- .2	- .2	- .2	- .2
	+ .3	+ .3	+ .3	+ .3	+ .2	+ .2	+ .1	.0	- .1	- .2	- .2	- .3
Apr.	+ .3	+ .4	+ .4	+ .4	+ .4	+ .3	+ .2	+ .1	.0	- .1	- .1	- .2
May	+ .2	+ .3	+ .3	+ .4	+ .4	+ .4	+ .3	+ .3	+ .2	+ .1	.0	- .1
June	+ .1	+ .2	+ .2	+ .3	+ .4	+ .4	+ .4	+ .4	+ .3	+ .2	+ .1	.0
July	- .1	.0	+ .1	+ .2	+ .2	+ .3	+ .3	+ .3	+ .3	+ .3	+ .2	+ .2
Aug.	- .2	- .2	- .1	.0	+ .1	+ .1	+ .2	+ .3	+ .3	+ .3	+ .3	+ .3
Sept.	- .3	- .3	- .2	- .2	- .1	.0	.0	+ .1	+ .2	+ .2	+ .3	+ .3
Oct.	- .3	- .3	- .4	- .3	- .3	- .2	- .2	- .1	.0	+ .1	+ .2	+ .3
Nov.	- .2	- .3	- .4	- .4	- .4	- .4	- .3	- .3	- .2	- .1	.0	+ .2
Dec.	- .1	- .2	- .3	- .4	- .5	- .5	- .5	- .4	- .3	- .2	- .1	.0

(B₀ + B₁ + B₂)AZIMUTH OF POLARIS -----
COS LATITUDE

Table 12b. To Determine Azimuth From Polaris, 1989

L.S.T.	0 ^h	1 ^h	2 ^h	3 ^h	4 ^h	5 ^h	6 ^h	7 ^h	8 ^h	9 ^h	10 ^h	11 ^h
	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀
M	°	°	°	°	°	°	°	°	°	°	°	°
0	+27.3	+16.3	+ 4.2	- 8.2	-20.0	-30.4	-38.6	-44.2	-46.7	-46.0	-42.2	-35.5
3	26.8	15.8	3.6	8.8	20.5	30.9	39.0	44.4	46.7	45.9	41.9	35.1
6	26.3	15.2	3.0	9.4	21.1	31.3	39.3	44.6	46.8	45.7	41.6	34.7
9	25.7	14.6	2.4	10.0	21.7	31.8	39.7	44.8	46.8	45.6	41.3	34.3
12	25.2	14.0	1.8	10.6	22.2	32.2	40.0	44.9	46.8	45.5	41.1	33.9
15	+24.7	+13.4	+ 1.1	-11.2	-22.7	-32.7	-40.3	-45.1	-46.8	-45.3	-40.8	-33.5
18	24.2	12.8	+ 0.5	11.8	23.3	33.1	40.6	45.3	46.8	45.2	40.5	33.1
21	23.6	12.2	- 0.1	12.4	23.8	33.5	40.9	45.4	46.8	45.0	40.1	32.6
24	23.1	11.6	0.7	13.0	24.4	34.0	41.2	45.6	46.8	44.8	39.8	32.2
27	22.6	11.0	1.4	13.6	24.9	34.4	41.5	45.7	46.8	44.6	39.5	31.8
30	+22.0	+10.4	- 2.0	-14.2	-25.4	-34.8	-41.8	-45.8	-46.7	-44.4	-39.2	-31.3
33	21.5	9.8	2.6	14.8	25.9	35.2	42.1	46.0	46.7	44.3	38.8	30.9
36	20.9	9.2	3.2	15.4	26.4	35.6	42.3	46.1	46.6	44.0	38.5	30.4
39	20.3	8.6	3.8	16.0	27.0	36.0	42.6	46.2	46.6	43.8	38.2	29.9
42	19.8	7.9	4.5	16.5	27.5	36.4	42.8	46.3	46.5	43.6	37.8	29.5
45	+19.2	+ 7.3	- 5.1	-17.1	-28.0	-36.8	-43.1	-46.4	-46.5	-43.4	-37.4	-29.0
48	18.6	6.7	5.7	17.7	28.5	37.2	43.3	46.4	46.4	43.2	37.1	28.5
51	18.1	6.1	6.3	18.3	28.9	37.6	43.5	46.5	46.3	42.9	36.7	28.0
54	17.5	5.5	6.9	18.8	29.4	37.9	43.8	46.6	46.2	42.7	36.3	27.6
57	16.9	4.9	7.5	19.4	29.9	38.3	44.0	46.6	46.1	42.4	35.9	27.1
60	+16.3	+ 4.2	- 8.2	-20.0	-30.4	-38.6	-44.2	-46.7	-46.0	-42.2	-35.5	-26.6
LAT	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁
	°	°	°	°	°	°	°	°	°	°	°	°
0	- .3	- .2	.0	+ .2	+ .3	+ .4	+ .3	+ .2	.0	- .2	- .3	- .4
10	- .3	- .1	.0	+ .2	+ .3	+ .3	+ .3	+ .1	.0	- .2	- .3	- .3
20	- .2	- .1	.0	+ .2	+ .2	+ .3	+ .2	+ .1	.0	- .2	- .2	- .3
30	- .2	- .1	.0	+ .1	+ .2	+ .2	+ .2	+ .1	.0	- .1	- .2	- .2
40	- .1	.0	.0	+ .1	+ .1	+ .1	+ .1	.0	.0	- .1	- .1	- .1
45	- .1	.0	.0	.0	+ .1	+ .1	+ .1	.0	.0	.0	- .1	- .1
50	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
55	+ .1	.0	.0	.0	- .1	- .1	- .1	.0	.0	.0	+ .1	+ .1
60	+ .1	+ .1	.0	- .1	- .2	- .2	- .1	- .1	.0	+ .1	+ .2	+ .2
62	+ .2	+ .1	.0	- .1	- .2	- .2	- .2	- .1	.0	+ .1	+ .2	+ .2
64	+ .2	+ .1	.0	- .2	- .2	- .3	- .2	- .1	.0	+ .2	+ .2	+ .3
66	+ .3	+ .1	.0	- .2	- .3	- .3	- .3	- .1	.0	+ .2	+ .3	+ .3
MONTH	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂
	°	°	°	°	°	°	°	°	°	°	°	°
Jan.	- .1	- .1	- .1	.0	.0	+ .1	+ .1	+ .1	+ .1	+ .2	+ .2	+ .1
Feb.	- .2	- .2	- .2	- .1	- .1	.0	.0	+ .1	+ .2	+ .2	+ .2	+ .3
Mar.	- .3	- .3	- .3	- .3	- .2	- .2	- .1	.0	+ .1	+ .2	+ .2	+ .3
Apr.	- .3	- .4	- .4	- .4	- .4	- .3	- .2	- .1	- .1	.0	+ .1	+ .2
May	- .2	- .3	- .4	- .4	- .4	- .4	- .3	- .3	- .2	- .1	.0	+ .1
June	- .1	- .2	- .2	- .3	- .4	- .4	- .4	- .4	- .3	- .2	- .1	.0
July	+ .1	.0	- .1	- .2	- .2	- .3	- .3	- .4	- .3	- .3	- .3	- .2
Aug.	+ .2	+ .2	+ .1	.0	- .1	- .1	- .2	- .3	- .3	- .3	- .3	- .3
Sept.	+ .3	+ .3	+ .2	+ .2	+ .1	.0	.0	- .1	- .2	- .3	- .3	- .3
Oct.	+ .3	+ .3	+ .4	+ .3	+ .3	+ .2	+ .1	+ .1	.0	- .1	- .2	- .3
Nov.	+ .3	+ .3	+ .4	+ .4	+ .4	+ .4	+ .3	+ .2	+ .2	.0	- .1	- .2
Dec.	+ .1	+ .2	+ .3	+ .4	+ .4	+ .5	+ .4	+ .4	+ .3	+ .2	+ .1	.0

(B0 + B1 + B2)

AZIMUTH OF POLARIS -----
COS LATITUDE

Table 12b. To Determine Azimuth From Polaris, 1989—Continued

L.S.T.	12 ^h	13 ^h	14 ^h	15 ^h	16 ^h	17 ^h	18 ^h	19 ^h	20 ^h	21 ^h	22 ^h	23 ^h
	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀
M	°	°	°	°	°	°	°	°	°	°	°	°
0	-26.6	-15.9	-4.1	+7.9	+19.4	+29.6	+37.9	+43.7	+46.5	+46.2	+42.7	+36.3
3	26.1	15.3	3.5	8.5	19.9	30.1	38.3	43.9	46.6	46.1	42.5	35.9
6	25.6	14.7	2.9	9.1	20.5	30.6	38.6	44.1	46.7	46.0	42.2	35.5
9	25.1	14.1	2.3	9.7	21.0	31.0	39.0	44.3	46.7	45.9	42.0	35.1
12	24.5	13.6	1.7	10.3	21.6	31.5	39.3	44.5	46.7	45.8	41.7	34.7
15	-24.0	-13.0	-1.1	+10.9	+22.1	+31.9	+39.6	+44.7	+46.8	+45.7	+41.4	+34.3
18	23.5	12.4	-0.5	11.4	22.6	32.4	39.9	44.9	46.8	45.5	41.1	33.8
21	23.0	11.8	+0.1	12.0	23.2	32.8	40.3	45.0	46.8	45.4	40.8	33.4
24	22.5	11.2	0.7	12.6	23.7	33.2	40.6	45.2	46.8	45.2	40.5	33.0
27	21.9	10.6	1.3	13.2	24.2	33.6	40.9	45.4	46.8	45.1	40.2	32.5
30	-21.4	-10.1	+1.9	+13.8	+24.7	+34.1	+41.2	+45.5	+46.8	+44.9	+39.9	+32.1
33	20.8	9.5	2.5	14.3	25.2	34.5	41.4	45.6	46.8	44.7	39.5	31.6
36	20.3	8.9	3.1	14.9	25.7	34.9	41.7	45.8	46.7	44.5	39.2	31.2
39	19.8	8.3	3.7	15.5	26.2	35.3	42.0	45.9	46.7	44.3	38.9	30.7
42	19.2	7.7	4.3	16.1	26.7	35.7	42.3	46.0	46.7	44.1	38.5	30.2
45	-18.7	-7.1	+4.9	+16.6	+27.2	+36.1	+42.5	+46.1	+46.6	+43.9	+38.2	+29.7
48	18.1	6.5	5.5	17.2	27.7	36.5	42.8	46.2	46.6	43.7	37.8	29.3
51	17.5	5.9	6.1	17.7	28.2	36.8	43.0	46.3	46.5	43.5	37.4	28.8
54	17.0	5.3	6.7	18.3	28.7	37.2	43.2	46.4	46.4	43.2	37.1	28.3
57	16.4	4.7	7.3	18.9	29.2	37.6	43.5	46.5	46.3	43.0	36.7	27.8
60	-15.9	-4.1	+7.9	+19.4	+29.6	+37.9	+43.7	+46.5	+46.2	+42.7	+36.3	+27.3
LAT	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁
0	°	°	°	°	°	°	°	°	°	°	°	°
10	-3	-2	0	+2	+3	+4	+3	+2	0	-2	-3	-4
20	-3	-1	0	+2	+3	+3	+3	+1	0	-2	-3	-3
30	-2	-1	0	+2	+2	+3	+2	+1	0	-2	-2	-3
40	-2	-1	0	+1	+2	+2	+2	+1	0	-1	-2	-2
45	-1	0	0	+1	+1	+1	+1	0	0	-1	-1	-1
50	-1	0	0	0	+1	+1	+1	0	0	0	-1	-1
55	0	0	0	0	0	0	0	0	0	0	0	0
60	+1	0	0	0	-1	-1	-1	0	0	0	+1	+1
62	+1	+1	0	-1	-2	-2	-1	-1	0	+1	+2	+2
64	+2	+1	0	-2	-2	-3	-2	-1	0	+2	+2	+3
66	+3	+1	0	-2	-3	-3	-3	-1	0	+2	+3	+3
MONTH	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂
Jan.	°	°	°	°	°	°	°	°	°	°	°	°
Feb.	+1	+1	+1	0	0	-1	-1	-1	-1	-2	-2	-1
Mar.	+2	+2	+2	+1	+1	0	0	-1	-2	-2	-2	-3
Apr.	+3	+3	+3	+3	+2	+2	+1	0	-1	-2	-2	-3
May	+3	+4	+4	+4	+4	+3	+2	+1	+1	0	-1	-2
June	+2	+3	+4	+4	+4	+4	+3	+3	+2	+1	0	-1
July	+1	+2	+2	+3	+4	+4	+4	+4	+3	+2	+1	0
Aug.	-1	0	+1	+2	+2	+3	+3	+4	+3	+3	+3	+2
Sept.	-2	-2	-1	0	+1	+1	+2	+3	+3	+3	+3	+3
Oct.	-3	-3	-2	-2	-1	0	0	+1	+2	+3	+3	+3
Nov.	-3	-3	-4	-3	-3	-2	-1	-1	0	+1	+2	+3
Dec.	-3	-3	-4	-4	-4	-4	-3	-2	-2	0	+1	+2
	-1	-2	-3	-4	-4	-5	-4	-4	-3	-2	-1	0

(B0 + B1 + B2)

AZIMUTH OF POLARIS

COS LATITUDE

Table 12c. To Determine Azimuth From Polaris, 1990

L.S.T.	0 ^h	1 ^h	2 ^h	3 ^h	4 ^h	5 ^h	6 ^h	7 ^h	8 ^h	9 ^h	10 ^h	11 ^h
	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀
M	°	°	°	°	°	°	°	°	°	°	°	°
0	+27.3	+16.5	+ 4.5	- 7.9	-19.6	-30.0	-38.2	-43.8	-46.4	-45.7	-42.0	-35.5
3	26.8	15.9	3.8	8.5	20.2	30.5	38.6	44.0	46.4	45.6	41.7	35.1
6	26.3	15.3	3.2	9.1	20.7	30.9	38.9	44.2	46.4	45.5	41.5	34.7
9	25.8	14.7	2.6	9.7	21.3	31.4	39.3	44.4	46.5	45.4	41.2	34.3
12	25.3	14.1	2.0	10.3	21.8	31.8	39.6	44.6	46.5	45.2	40.9	33.9
15	+24.8	+13.5	+ 1.4	-10.9	-22.4	-32.3	-39.9	-44.8	-46.5	-45.1	-40.6	-33.5
18	24.2	13.0	0.8	11.5	22.9	32.7	40.2	44.9	46.5	44.9	40.3	33.0
21	23.7	12.4	+ 0.1	12.1	23.5	33.2	40.5	45.1	46.5	44.8	40.0	32.6
24	23.2	11.8	- 0.5	12.7	24.0	33.6	40.8	45.2	46.5	44.6	39.7	32.2
27	22.6	11.2	1.1	13.3	24.5	34.0	41.1	45.4	46.5	44.4	39.4	31.7
30	+22.1	+10.6	- 1.7	-13.9	-25.0	-34.4	-41.4	-45.5	-46.4	-44.2	-39.1	-31.3
33	21.5	10.0	2.3	14.5	25.5	34.8	41.7	45.6	46.4	44.0	38.7	30.8
36	21.0	9.4	2.9	15.0	26.1	35.2	41.9	45.7	46.4	43.9	38.4	30.4
39	20.4	8.7	3.6	15.6	26.6	35.6	42.2	45.8	46.3	43.6	38.1	29.9
42	19.9	8.1	4.2	16.2	27.1	36.0	42.5	45.9	46.3	43.4	37.7	29.5
45	+19.3	+ 7.5	- 4.8	-16.8	-27.6	-36.4	-42.7	-46.0	-46.2	-43.2	-37.3	-29.0
48	18.8	6.9	5.4	17.4	28.1	36.8	42.9	46.1	46.1	43.0	37.0	28.5
51	18.2	6.3	6.0	17.9	28.6	37.2	43.2	46.2	46.0	42.8	36.6	28.1
54	17.6	5.7	6.6	18.5	29.0	37.5	43.4	46.3	45.9	42.5	36.2	27.6
57	17.0	5.1	7.2	19.1	29.5	37.9	43.6	46.3	45.8	42.3	35.9	27.1
60	+16.5	+ 4.5	- 7.9	-19.6	-30.0	-38.2	-43.8	-46.4	-45.7	-42.0	-35.5	-26.6
LAT	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁
	°	°	°	°	°	°	°	°	°	°	°	°
0	- .3	- .2	.0	+ .2	+ .3	+ .4	+ .3	+ .2	.0	- .2	- .3	- .4
10	- .3	- .1	.0	+ .2	+ .3	+ .3	+ .3	+ .1	.0	- .2	- .3	- .3
20	- .2	- .1	.0	+ .1	+ .2	+ .3	+ .2	+ .1	.0	- .1	- .2	- .3
30	- .2	- .1	.0	+ .1	+ .2	+ .2	+ .2	+ .1	.0	- .1	- .2	- .2
40	- .1	.0	.0	+ .1	+ .1	+ .1	+ .1	.0	.0	- .1	- .1	- .1
45	.0	.0	.0	.0	+ .1	+ .1	.0	.0	.0	.0	- .1	- .1
50	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
55	+ .1	.0	.0	.0	- .1	- .1	- .1	.0	.0	.0	+ .1	+ .1
60	+ .1	+ .1	.0	- .1	- .2	- .2	- .1	- .1	.0	+ .1	+ .2	+ .2
62	+ .2	+ .1	.0	- .1	- .2	- .2	- .2	- .1	.0	+ .1	+ .2	+ .2
64	+ .2	+ .1	.0	- .2	- .2	- .3	- .2	- .1	.0	+ .2	+ .2	+ .3
66	+ .3	+ .1	.0	- .2	- .3	- .3	- .3	- .1	.0	+ .2	+ .3	+ .3
MONTH	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂
	°	°	°	°	°	°	°	°	°	°	°	°
Jan.	- .1	- .1	- .1	.0	.0	+ .1	+ .1	+ .1	+ .1	+ .1	+ .1	+ .1
Feb.	- .2	- .2	- .2	- .2	- .1	.0	.0	+ .1	+ .1	+ .2	+ .2	+ .2
Mar.	- .3	- .3	- .3	- .3	- .2	- .2	- .1	.0	+ .1	+ .1	+ .2	+ .3
Apr.	- .3	- .3	- .4	- .4	- .4	- .3	- .3	- .2	- .1	.0	+ .1	+ .2
May	- .2	- .3	- .4	- .4	- .4	- .4	- .4	- .3	- .2	- .1	.0	+ .1
June	.0	- .2	- .2	- .3	- .4	- .4	- .4	- .4	- .3	- .3	- .2	- .1
July	+ .1	.0	- .1	- .2	- .3	- .3	- .4	- .4	- .4	- .3	- .3	- .2
Aug.	+ .2	+ .2	+ .1	.0	- .1	- .2	- .2	- .3	- .3	- .3	- .3	- .3
Sept.	+ .3	+ .3	+ .2	+ .2	+ .1	.0	- .1	- .1	- .2	- .3	- .3	- .3
Oct.	+ .3	+ .4	+ .3	+ .3	+ .3	+ .2	+ .1	.0	- .1	- .1	- .2	- .3
Nov.	+ .3	+ .3	+ .4	+ .4	+ .4	+ .4	+ .3	+ .2	+ .1	.0	- .1	- .2
Dec.	+ .1	+ .2	+ .3	+ .4	+ .4	+ .4	+ .4	+ .4	+ .3	+ .2	+ .1	.0

(B₀ + B₁ + B₂)AZIMUTH OF POLARIS -----
COS LATITUDE

Table 12c. To Determine Azimuth From Polaris, 1990—Continued

L.S.T.	12 ^h	13 ^h	14 ^h	15 ^h	16 ^h	17 ^h	18 ^h	19 ^h	20 ^h	21 ^h	22 ^h	23 ^h
	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀
M	°	°	°	°	°	°	°	°	°	°	°	°
0	-26.6	-16.0	- 4.3	+ 7.6	+19.1	+29.3	+37.5	+43.3	+46.2	+46.0	+42.6	+36.2
3	26.1	15.4	3.7	8.2	19.6	29.7	37.9	43.5	46.3	45.9	42.3	35.8
6	25.6	14.9	3.1	8.8	20.1	30.2	38.2	43.8	46.3	45.8	42.1	35.4
9	25.1	14.3	2.5	9.4	20.7	30.6	38.6	44.0	46.4	45.7	41.8	35.0
12	24.6	13.7	1.9	10.0	21.2	31.1	38.9	44.2	46.4	45.5	41.5	34.6
15	-24.1	-13.1	- 1.3	+10.6	+21.8	+31.5	+39.2	+44.3	+46.5	+45.4	+41.2	+34.2
18	23.6	12.6	0.7	11.1	22.3	32.0	39.6	44.5	46.5	45.3	41.0	33.8
21	23.0	12.0	- 0.1	11.7	22.8	32.4	39.9	44.7	46.5	45.1	40.7	33.4
24	22.5	11.4	+ 0.5	12.3	23.3	32.8	40.2	44.9	46.5	45.0	40.4	32.9
27	22.0	10.8	1.1	12.9	23.8	33.3	40.5	45.0	46.5	44.8	40.1	32.5
30	-21.5	-10.2	+ 1.7	+13.4	+24.4	+33.7	+40.8	+45.2	+46.5	+44.7	+39.7	+32.0
33	20.9	9.7	2.3	14.0	24.9	34.1	41.1	45.3	46.5	44.5	39.4	31.6
36	20.4	9.1	2.9	14.6	25.4	34.5	41.3	45.4	46.5	44.3	39.1	31.1
39	19.9	8.5	3.5	15.2	25.9	34.9	41.6	45.6	46.4	44.1	38.8	30.7
42	19.3	7.9	4.0	15.7	26.4	35.3	41.9	45.7	46.4	43.9	38.4	30.2
45	-18.8	- 7.3	+ 4.6	+16.3	+26.9	+35.7	+42.1	+45.8	+46.3	+43.7	+38.1	+29.7
48	18.2	6.7	5.2	16.8	27.4	36.1	42.4	45.9	46.3	43.5	37.7	29.3
51	17.7	6.1	5.8	17.4	27.8	36.4	42.6	46.0	46.2	43.3	37.3	28.8
54	17.1	5.5	6.4	18.0	28.3	36.8	42.9	46.1	46.1	43.0	37.0	28.3
57	16.5	4.9	7.0	18.5	28.8	37.2	43.1	46.2	46.1	42.8	36.6	27.8
60	-16.0	- 4.3	+ 7.6	+19.1	+29.3	+37.5	+43.3	+46.2	+46.0	+42.6	+36.2	+27.3
LAT	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁
0	°	°	°	°	°	°	°	°	°	°	°	°
10	- .3	- .2	.0	+ .2	+ .3	+ .4	+ .3	+ .2	.0	- .2	- .3	- .4
20	- .3	- .1	.0	+ .2	+ .3	+ .3	+ .3	+ .1	.0	- .2	- .3	- .3
30	- .2	- .1	.0	+ .1	+ .2	+ .3	+ .2	+ .1	.0	- .1	- .2	- .3
40	- .2	- .1	.0	+ .1	+ .2	+ .2	+ .2	+ .1	.0	- .1	- .2	- .2
45	- .1	.0	.0	+ .1	+ .1	+ .1	+ .1	.0	.0	- .1	- .1	- .1
50	.0	.0	.0	.0	+ .1	+ .1	.0	.0	.0	.0	- .1	- .1
55	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
60	+ .1	.0	.0	.0	- .1	- .1	- .1	.0	.0	.0	+ .1	+ .1
62	+ .1	+ .1	.0	- .1	- .2	- .2	- .1	- .1	.0	+ .1	+ .2	+ .2
64	+ .2	+ .1	.0	- .1	- .2	- .2	- .2	- .1	.0	+ .1	+ .2	+ .2
66	+ .2	+ .1	.0	- .2	- .2	- .3	- .2	- .1	.0	+ .2	+ .2	+ .3
66	+ .3	+ .1	.0	- .2	- .3	- .3	- .3	- .1	.0	+ .2	+ .3	+ .3
MONTH	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂
Jan.	°	°	°	°	°	°	°	°	°	°	°	°
Feb.	+ .1	+ .1	+ .1	.0	.0	- .1	- .1	- .1	- .1	- .1	- .1	- .1
Mar.	+ .2	+ .2	+ .2	+ .2	+ .1	.0	.0	- .1	- .1	- .2	- .2	- .2
Apr.	+ .3	+ .3	+ .3	+ .3	+ .2	+ .2	+ .1	.0	- .1	- .1	- .2	- .3
May	+ .3	+ .3	+ .4	+ .4	+ .4	+ .3	+ .3	+ .2	+ .1	.0	- .1	- .2
June	+ .2	+ .3	+ .4	+ .4	+ .4	+ .4	+ .4	+ .3	+ .2	+ .1	.0	- .1
July	.0	+ .2	+ .2	+ .3	+ .4	+ .4	+ .4	+ .4	+ .3	+ .3	+ .2	+ .1
Aug.	- .1	.0	+ .1	+ .2	+ .3	+ .3	+ .4	+ .4	+ .4	+ .3	+ .3	+ .2
Sept.	- .2	- .2	- .1	.0	+ .1	+ .2	+ .2	+ .3	+ .3	+ .3	+ .3	+ .3
Oct.	- .3	- .3	- .2	- .2	- .1	.0	+ .1	+ .1	+ .2	+ .3	+ .3	+ .3
Nov.	- .3	- .3	- .4	- .4	- .4	- .4	- .4	- .4	- .4	- .4	- .4	- .4
Dec.	- .1	- .2	- .3	- .4	- .4	- .4	- .4	- .4	- .4	- .4	- .4	- .4

(B₀ + B₁ + B₂)AZIMUTH OF POLARIS —————
COS LATITUDE

Table 12d. To Determine Azimuth From Polaris, 1991

L.S.T.	0 ^h	1 ^h	2 ^h	3 ^h	4 ^h	5 ^h	6 ^h	7 ^h	8 ^h	9 ^h	10 ^h	11 ^h
	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀
M	•	•	•	•	•	•	•	•	•	•	•	•
0	+27.4	+16.6	+ 4.7	- 7.6	-19.3	-29.7	-37.9	-43.5	-46.1	-45.6	-41.9	-35.5
3	26.9	16.1	4.1	8.2	19.9	30.1	38.3	43.8	46.2	45.5	41.7	35.1
6	26.4	15.5	3.5	8.8	20.4	30.6	38.6	43.9	46.2	45.3	41.4	34.7
9	25.9	14.9	2.9	9.4	21.0	31.1	39.0	44.1	46.3	45.2	41.1	34.3
12	25.4	14.3	2.2	10.0	21.5	31.5	39.3	44.3	46.3	45.1	40.9	33.9
15	+24.9	+13.7	+ 1.6	-10.6	-22.1	-32.0	-39.6	-44.5	-46.3	-44.9	-40.6	-33.5
18	24.3	13.1	1.0	11.2	22.6	32.4	39.9	44.7	46.3	44.8	40.3	33.1
21	23.8	12.6	+ 0.4	11.8	23.1	32.8	40.2	44.8	46.3	44.6	40.0	32.6
24	23.3	12.0	- 0.2	12.4	23.7	33.3	40.5	45.0	46.3	44.5	39.7	32.2
27	22.8	11.4	0.8	13.0	24.2	33.7	40.8	45.1	46.3	44.3	39.4	31.8
30	+22.2	+10.8	- 1.4	-13.6	-24.7	-34.1	-41.1	-45.2	-46.3	-44.1	-39.0	-31.3
33	21.7	10.2	2.1	14.1	25.2	34.5	41.4	45.4	46.2	43.9	38.7	30.9
36	21.1	9.6	2.7	14.7	25.7	34.9	41.6	45.5	46.2	43.7	38.4	30.5
39	20.6	9.0	3.3	15.3	26.2	35.3	41.9	45.6	46.1	43.5	38.0	30.0
42	20.0	8.4	3.9	15.9	26.7	35.7	42.2	45.7	46.1	43.3	37.7	29.5
45	+19.5	+ 7.8	- 4.5	-16.5	-27.2	-36.1	-42.4	-45.8	-46.0	-43.1	-37.3	-29.1
48	18.9	7.1	5.1	17.0	27.7	36.5	42.7	45.9	45.9	42.9	37.0	28.6
51	18.3	6.5	5.7	17.6	28.2	36.9	42.9	46.0	45.9	42.7	36.6	28.1
54	17.8	5.9	6.4	18.2	28.7	37.2	43.1	46.0	45.8	42.4	36.2	27.7
57	17.2	5.3	7.0	18.7	29.2	37.6	43.3	46.1	45.7	42.2	35.9	27.2
60	+16.6	+ 4.7	- 7.6	-19.3	-29.7	-37.9	-43.5	-46.1	-45.6	-41.9	-35.5	-26.7
LAT	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁
0	•	•	•	•	•	•	•	•	•	•	•	•
10	- .3	- .2	.0	+ .2	+ .3	+ .4	+ .3	+ .2	.0	- .2	- .3	- .4
20	- .3	- .1	.0	+ .2	+ .3	+ .3	+ .3	+ .1	.0	- .2	- .3	- .3
30	- .2	- .1	.0	+ .1	+ .2	+ .3	+ .2	+ .1	.0	- .1	- .2	- .3
40	- .2	- .1	.0	+ .1	+ .2	+ .2	+ .2	+ .1	.0	- .1	- .2	- .2
45	- .1	.0	.0	+ .1	+ .1	+ .1	+ .1	.0	.0	- .1	- .1	- .1
50	.0	.0	.0	.0	+ .1	+ .1	.0	.0	.0	.0	- .1	- .1
55	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
60	+ .1	.0	.0	.0	- .1	- .1	- .1	.0	.0	.0	+ .1	+ .1
62	+ .1	+ .1	.0	- .1	- .2	- .2	- .1	- .1	.0	+ .1	+ .2	+ .2
64	+ .2	+ .1	.0	- .1	- .2	- .3	- .2	- .1	.0	+ .1	+ .2	+ .3
66	+ .3	+ .1	.0	- .2	- .3	- .3	- .3	- .1	.0	+ .2	+ .3	+ .3
MONTH	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂
Jan.	•	•	•	•	•	•	•	•	•	•	•	•
Feb.	- .1	- .1	.0	.0	+ .1	+ .1	+ .1	+ .2	+ .2	+ .2	+ .2	+ .2
Mar.	- .3	- .2	- .2	- .1	- .1	.0	+ .1	+ .2	+ .2	+ .3	+ .3	+ .3
Apr.	- .3	- .3	- .3	- .3	- .2	- .1	.0	+ .1	+ .1	+ .2	+ .3	+ .3
May	- .3	- .4	- .4	- .4	- .3	- .3	- .2	- .1	.0	+ .1	+ .2	+ .3
June	- .2	- .3	- .3	- .4	- .4	- .4	- .3	- .2	- .1	.0	+ .1	+ .2
July	- .1	- .2	- .2	- .3	- .3	- .4	- .4	- .3	- .2	- .1	.0	.0
Aug.	+ .1	.0	- .1	- .2	- .2	- .3	- .3	- .3	- .3	- .3	- .2	- .2
Sept.	+ .2	+ .2	+ .1	.0	- .1	- .1	- .2	- .2	- .3	- .3	- .3	- .3
Oct.	+ .3	+ .3	+ .2	+ .2	+ .1	+ .1	.0	- .1	- .2	- .2	- .3	- .3
Nov.	+ .3	+ .3	+ .4	+ .3	+ .3	+ .2	+ .2	+ .1	.0	- .1	- .2	- .3
Dec.	+ .2	+ .3	+ .4	+ .4	+ .4	+ .4	+ .3	+ .3	+ .2	+ .1	.0	- .1
Dec.	+ .1	+ .2	+ .3	+ .4	+ .5	+ .5	+ .5	+ .4	+ .3	+ .2	+ .1	.0

(B₀ + B₁ + B₂)
 AZIMUTH OF POLARIS -----
 COS LATITUDE

Table 12d. To Determine Azimuth From Polaris, 1991—Continued

L.S.T.	12 ^h	13 ^h	14 ^h	15 ^h	16 ^h	17 ^h	18 ^h	19 ^h	20 ^h	21 ^h	22 ^h	23 ^h
	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀
M	°	°	°	°	°	°	°	°	°	°	°	°
0	-26.7	-16.1	- 4.6	+ 7.3	+18.7	+28.9	+37.2	+43.1	+46.0	+45.8	+42.5	+36.2
3	26.2	15.6	4.0	7.9	19.3	29.4	37.6	43.3	46.1	45.7	42.2	35.8
6	25.7	15.0	3.4	8.5	19.8	29.9	37.9	43.5	46.1	45.6	42.0	35.4
9	25.2	14.5	2.8	9.1	20.4	30.3	38.3	43.7	46.2	45.5	41.7	35.0
12	24.7	13.9	2.2	9.7	20.9	30.8	38.6	43.9	46.2	45.4	41.5	34.6
15	-24.2	-13.3	- 1.6	+10.3	+21.4	+31.2	+38.9	+44.1	+46.2	+45.3	+41.2	+34.2
18	23.7	12.7	1.0	10.8	22.0	31.7	39.3	44.3	46.3	45.1	40.9	33.8
21	23.2	12.2	- 0.4	11.4	22.5	32.1	39.6	44.4	46.3	45.0	40.6	33.4
24	22.6	11.6	+ 0.2	12.0	23.0	32.5	39.9	44.6	46.3	44.9	40.3	33.0
27	22.1	11.0	0.8	12.6	23.5	32.9	40.2	44.8	46.3	44.7	40.0	32.5
30	-21.6	-10.4	+ 1.4	+13.1	+24.0	+33.4	+40.5	+44.9	+46.3	+44.5	+39.7	+32.1
33	21.1	9.9	2.0	13.7	24.5	33.8	40.8	45.0	46.3	44.4	39.4	31.6
36	20.5	9.3	2.6	14.3	25.1	34.2	41.1	45.2	46.3	44.2	39.1	31.2
39	20.0	8.7	3.2	14.9	25.6	34.6	41.3	45.3	46.2	44.0	38.7	30.7
42	19.5	8.1	3.8	15.4	26.1	35.0	41.6	45.4	46.2	43.8	38.4	30.3
45	-18.9	- 7.5	+ 4.4	+16.0	+26.5	+35.4	+41.9	+45.5	+46.2	+43.6	+38.0	+29.8
48	18.4	6.9	5.0	16.5	27.0	35.8	42.1	45.7	46.1	43.4	37.7	29.3
51	17.8	6.3	5.6	17.1	27.5	36.1	42.4	45.7	46.0	43.2	37.3	28.9
54	17.3	5.7	6.2	17.6	28.0	36.5	42.6	45.8	46.0	43.0	37.0	28.4
57	16.7	5.1	6.7	18.2	28.5	36.9	42.8	45.9	45.9	42.7	36.6	27.9
60	-16.1	- 4.6	+ 7.3	+18.7	+28.9	+37.2	+43.1	+46.0	+45.8	+42.5	+36.2	+27.4
LAT	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁
	°	°	°	°	°	°	°	°	°	°	°	°
0	- .3	- .2	.0	+ .2	+ .3	+ .4	+ .3	+ .2	.0	- .2	- .3	- .4
10	- .3	- .1	.0	+ .2	+ .3	+ .3	+ .3	+ .1	.0	- .2	- .3	- .3
20	- .2	- .1	.0	+ .1	+ .2	+ .3	+ .2	+ .1	.0	- .1	- .2	- .3
30	- .2	- .1	.0	+ .1	+ .2	+ .2	+ .2	+ .1	.0	- .1	- .2	- .2
40	- .1	.0	.0	+ .1	+ .1	+ .1	+ .1	.0	.0	- .1	- .1	- .1
45	.0	.0	.0	.0	+ .1	+ .1	.0	.0	.0	.0	- .1	- .1
50	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
55	+ .1	.0	.0	.0	- .1	- .1	- .1	.0	.0	.0	+ .1	+ .1
60	+ .1	+ .1	.0	- .1	- .2	- .2	- .1	- .1	.0	+ .1	+ .2	+ .2
62	+ .2	+ .1	.0	- .1	- .2	- .2	- .2	- .1	.0	+ .1	+ .2	+ .2
64	+ .2	+ .1	.0	- .1	- .2	- .3	- .2	- .1	.0	+ .1	+ .2	+ .3
66	+ .3	+ .1	.0	- .2	- .3	- .3	- .3	- .1	.0	+ .2	+ .3	+ .3
MONTH	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂
	°	°	°	°	°	°	°	°	°	°	°	°
Jan.	+ .1	+ .1	.0	.0	- .1	- .1	- .1	- .2	- .2	- .2	- .2	- .2
Feb.	+ .3	+ .2	+ .2	+ .1	+ .1	.0	- .1	- .2	- .2	- .3	- .3	- .3
Mar.	+ .3	+ .3	+ .3	+ .3	+ .2	+ .1	.0	.0	- .1	- .2	- .3	- .3
Apr.	+ .3	+ .4	+ .4	+ .4	+ .3	+ .3	+ .2	+ .1	.0	- .1	- .2	- .3
May	+ .2	+ .3	+ .3	+ .4	+ .4	+ .4	+ .3	+ .2	+ .2	+ .1	.0	- .1
June	+ .1	+ .2	+ .2	+ .3	+ .3	+ .4	+ .4	+ .3	+ .3	+ .2	+ .1	.0
July	- .1	.0	+ .1	+ .2	+ .2	+ .3	+ .3	+ .3	+ .3	+ .3	+ .2	+ .2
Aug.	- .2	- .2	- .1	.0	+ .1	+ .1	+ .2	+ .2	+ .3	+ .3	+ .3	+ .3
Sept.	- .3	- .3	- .2	- .2	- .1	- .1	.0	+ .1	+ .2	+ .2	+ .3	+ .3
Oct.	- .3	- .3	- .4	- .3	- .3	- .2	- .2	- .1	.0	+ .1	+ .2	+ .3
Nov.	- .2	- .3	- .4	- .4	- .4	- .4	- .3	- .3	- .2	- .1	.0	+ .1
Dec.	- .1	- .2	- .3	- .4	- .5	- .5	- .5	- .4	- .3	- .2	- .1	.0

(B0 + B1 + B2)

AZIMUTH OF POLARIS -----

COS LATITUDE

Table 12e. To Determine Azimuth From Polaris, 1992

L.S.T.	0 ^h	1 ^h	2 ^h	3 ^h	4 ^h	5 ^h	6 ^h	7 ^h	8 ^h	9 ^h	10 ^h	11 ^h
	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀
M	°	°	°	°	°	°	°	°	°	°	°	°
0	+27.4	+16.8	+ 4.9	- 7.3	-18.9	-29.3	-37.5	-43.2	-45.8	-45.3	-41.8	-35.4
3	26.9	16.2	4.3	7.9	19.5	29.7	37.9	43.4	45.9	45.2	41.5	35.0
6	26.4	15.6	3.7	8.5	20.1	30.2	38.2	43.6	45.9	45.1	41.3	34.6
9	25.9	15.0	3.1	9.1	20.6	30.7	38.6	43.8	45.9	45.0	41.0	34.2
12	25.4	14.5	2.5	9.7	21.1	31.1	38.9	44.0	46.0	44.9	40.7	33.8
15	+24.9	+13.9	+ 1.9	-10.3	-21.7	-31.6	-39.2	-44.1	-46.0	-44.7	-40.4	-33.4
18	24.4	13.3	1.3	10.9	22.2	32.0	39.5	44.3	46.0	44.6	40.1	33.0
21	23.9	12.7	+ 0.7	11.5	22.8	32.4	39.8	44.5	46.0	44.4	39.8	32.6
24	23.4	12.1	0.0	12.1	23.3	32.9	40.1	44.6	46.0	44.3	39.5	32.2
27	22.8	11.5	- 0.6	12.6	23.8	33.3	40.4	44.8	46.0	44.1	39.2	31.8
30	+22.3	+10.9	- 1.2	-13.2	-24.3	-33.7	-40.7	-44.9	-46.0	-43.9	-38.9	-31.3
33	21.8	10.3	1.8	13.8	24.8	34.1	41.0	45.0	45.9	43.7	38.6	30.9
36	21.2	9.8	2.4	14.4	25.4	34.5	41.3	45.1	45.9	43.5	38.3	30.4
39	20.7	9.2	3.0	15.0	25.9	34.9	41.5	45.2	45.9	43.3	37.9	30.0
42	20.1	8.6	3.6	15.5	26.4	35.3	41.8	45.4	45.8	43.1	37.6	29.5
45	+19.6	+ 8.0	- 4.2	-16.1	-26.9	-35.7	-42.0	-45.5	-45.7	-42.9	-37.2	-29.1
48	19.0	7.3	4.8	16.7	27.4	36.1	42.3	45.5	45.7	42.7	36.9	28.6
51	18.5	6.7	5.5	17.3	27.8	36.5	42.5	45.6	45.6	42.5	36.5	28.2
54	17.9	6.1	6.1	17.8	28.3	36.8	42.7	45.7	45.5	42.3	36.2	27.7
57	17.3	5.5	6.7	18.4	28.8	37.2	43.0	45.8	45.4	42.0	35.8	27.2
60	+16.8	+ 4.9	- 7.3	-18.9	-29.3	-37.5	-43.2	-45.8	-45.3	-41.8	-35.4	-26.7
LAT	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁
	°	°	°	°	°	°	°	°	°	°	°	°
0	- .3	- .2	.0	+ .2	+ .3	+ .4	+ .3	+ .2	.0	- .2	- .3	- .4
10	- .3	- .1	.0	+ .2	+ .3	+ .3	+ .3	+ .1	.0	- .2	- .3	- .3
20	- .2	- .1	.0	+ .1	+ .2	+ .3	+ .2	+ .1	.0	- .1	- .2	- .3
30	- .2	- .1	.0	+ .1	+ .2	+ .2	+ .2	+ .1	.0	- .1	- .2	- .2
40	- .1	.0	.0	+ .1	+ .1	+ .1	+ .1	.0	.0	- .1	- .1	- .1
45	.0	.0	.0	.0	+ .1	+ .1	.0	.0	.0	.0	- .1	- .1
50	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
55	+ .1	.0	.0	.0	- .1	- .1	- .1	.0	.0	.0	+ .1	+ .1
60	+ .1	+ .1	.0	- .1	- .1	- .2	- .1	- .1	.0	+ .1	+ .1	+ .2
62	+ .2	+ .1	.0	- .1	- .2	- .2	- .2	- .1	.0	+ .1	+ .2	+ .2
64	+ .2	+ .1	.0	- .1	- .2	- .3	- .2	- .1	.0	+ .1	+ .2	+ .3
66	+ .3	+ .1	.0	- .2	- .3	- .3	- .3	- .1	.0	+ .2	+ .3	+ .3
MONTH	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂
	°	°	°	°	°	°	°	°	°	°	°	°
Jan.	- .1	- .1	.0	.0	.0	+ .1	+ .1	+ .1	+ .1	+ .2	+ .2	+ .1
Feb.	- .2	- .2	- .2	- .1	- .1	.0	.0	+ .1	+ .2	+ .2	+ .2	+ .3
Mar.	- .3	- .3	- .3	- .3	- .2	- .2	- .1	.0	+ .1	+ .2	+ .2	+ .3
Apr.	- .3	- .4	- .4	- .4	- .4	- .3	- .2	- .2	- .1	.0	+ .1	+ .2
May	- .2	- .3	- .3	- .4	- .4	- .4	- .4	- .3	- .2	- .1	.0	+ .1
June	.0	- .1	- .2	- .3	- .4	- .4	- .4	- .4	- .3	- .2	- .2	- .1
July	+ .1	.0	- .1	- .2	- .2	- .3	- .4	- .4	- .4	- .3	- .3	- .2
Aug.	+ .2	+ .2	+ .1	.0	- .1	- .2	- .2	- .3	- .3	- .3	- .3	- .3
Sept.	+ .3	+ .3	+ .2	+ .2	+ .1	.0	- .1	- .2	- .3	- .3	- .3	- .3
Oct.	+ .3	+ .4	+ .4	+ .3	+ .3	+ .2	+ .1	.0	- .1	- .1	- .2	- .3
Nov.	+ .3	+ .3	+ .4	+ .4	+ .4	+ .4	+ .3	+ .2	.0	.0	- .1	- .2
Dec.	+ .1	+ .2	+ .3	+ .4	+ .4	+ .4	+ .4	+ .4	+ .3	+ .2	+ .1	.0

(B₀ + B₁ + B₂)
 AZIMUTH OF POLARIS

 COS LATITUDE

Table 12e. To Determine Azimuth From Polaris, 1992—Continued

L.S.T.	12 ^h	13 ^h	14 ^h	15 ^h	16 ^h	17 ^h	18 ^h	19 ^h	20 ^h	21 ^h	22 ^h	23 ^h
	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀	b ₀
M	•	•	•	•	•	•	•	•	•	•	•	•
0	-26.7	-16.3	- 4.8	+ 7.0	+18.4	+28.6	+36.8	+42.7	+45.7	+45.6	+42.3	+36.1
3	26.2	15.7	4.2	7.6	18.9	29.0	37.2	42.9	45.7	45.5	42.1	35.8
6	25.7	15.2	3.6	8.2	19.5	29.5	37.5	43.1	45.8	45.4	41.8	35.4
9	25.2	14.6	3.0	8.8	20.0	29.9	37.9	43.3	45.9	45.3	41.6	35.0
12	24.8	14.0	2.4	9.4	20.6	30.4	38.2	43.5	45.9	45.2	41.3	34.6
15	-24.2	-13.5	- 1.8	+10.0	+21.1	+30.8	+38.6	+43.7	+45.9	+45.0	+41.0	+34.2
18	23.7	12.9	1.2	10.5	21.6	31.3	38.9	43.9	46.0	44.9	40.8	33.8
21	23.2	12.3	- 0.6	11.1	22.1	31.7	39.2	44.1	46.0	44.8	40.5	33.3
24	22.7	11.8	0.0	11.7	22.6	32.1	39.5	44.2	46.0	44.6	40.2	32.9
27	22.2	11.2	+ 0.6	12.3	23.2	32.6	39.8	44.4	46.0	44.5	39.9	32.5
30	-21.7	-10.6	+ 1.1	+12.8	+23.7	+33.0	+40.1	+44.6	+46.0	+44.3	+39.6	+32.1
33	21.2	10.0	1.7	13.4	24.2	33.4	40.4	44.7	46.0	44.1	39.3	31.6
36	20.6	9.5	2.3	14.0	24.7	33.8	40.7	44.8	46.0	44.0	38.9	31.2
39	20.1	8.9	2.9	14.5	25.2	34.2	40.9	45.0	46.0	43.8	38.6	30.7
42	19.6	8.3	3.5	15.1	25.7	34.6	41.2	45.1	45.9	43.6	38.3	30.3
45	-19.0	- 7.7	+ 4.1	+15.6	+26.2	+35.0	+41.5	+45.2	+45.9	+43.4	+37.9	+29.8
48	18.5	7.1	4.7	16.2	26.7	35.4	41.7	45.3	45.8	43.2	37.6	29.3
51	17.9	6.5	5.3	16.8	27.1	35.7	42.0	45.4	45.8	43.0	37.2	28.9
54	17.4	5.9	5.9	17.3	27.6	36.1	42.2	45.5	45.7	42.8	36.9	28.4
57	16.8	5.4	6.5	17.9	28.1	36.5	42.5	45.6	45.6	42.5	36.5	27.9
60	-16.3	- 4.8	+ 7.0	+18.4	+28.6	+36.8	+42.7	+45.7	+45.6	+42.3	+36.1	+27.4
LAT	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁	b ₁
0	•	•	•	•	•	•	•	•	•	•	•	•
10	-3	-2	.0	+2	+3	+4	+3	+2	.0	-2	-3	-4
20	-3	-1	.0	+2	+3	+3	+3	+1	.0	-2	-3	-3
30	-2	-1	.0	+1	+2	+3	+2	+1	.0	-1	-2	-3
40	-2	-1	.0	+1	+2	+2	+2	+1	.0	-1	-2	-2
45	-1	.0	.0	+1	+1	+1	+1	.0	.0	-1	-1	-1
50	.0	.0	.0	.0	+1	+1	.0	.0	.0	.0	-1	-1
55	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
60	+1	.0	.0	.0	-1	-1	-1	.0	.0	.0	+1	+1
65	+1	+1	.0	-1	-1	-2	-1	-1	.0	+1	+1	+2
70	+2	+1	.0	-1	-2	-2	-2	-1	.0	+1	+2	+2
75	+2	+1	.0	-1	-2	-3	-2	-1	.0	+1	+2	+3
80	+3	+1	.0	-2	-3	-3	-3	-1	.0	+2	+3	+3
MONTH	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂	b ₂
Jan.	•	•	•	•	•	•	•	•	•	•	•	•
Feb.	+1	+1	.0	.0	.0	-1	-1	-1	-1	-2	-2	-1
Mar.	+2	+2	+2	+1	+1	.0	.0	-1	-2	-2	-2	-3
Apr.	+3	+3	+3	+3	+2	+2	+1	.0	-1	-2	-2	-3
May	+3	+4	+4	+4	+4	+3	+2	+2	+1	.0	-1	-2
June	+2	+3	+3	+4	+4	+4	+4	+3	+2	+1	.0	-1
July	.0	+1	+2	+3	+4	+4	+4	+4	+3	+2	+2	+1
Aug.	-1	.0	+1	+2	+2	+3	+4	+4	+4	+3	+3	+2
Sept.	-2	-2	-1	.0	+1	+2	+2	+3	+3	+3	+3	+3
Oct.	-3	-3	-2	-2	-1	.0	+1	+1	+2	+3	+3	+3
Nov.	-3	-4	-4	-3	-3	-2	-1	.0	+1	+1	+2	+3
Dec.	-3	-3	-4	-4	-4	-4	-3	-2	-1	.0	+1	+2
	-1	-2	-3	-4	-4	-4	-4	-4	-3	-2	-1	.0

(B₀ + B₁ + B₂)AZIMUTH OF POLARIS -----
COS LATITUDE

Table 13. Grid Azimuth Correction, Simultaneous Observation

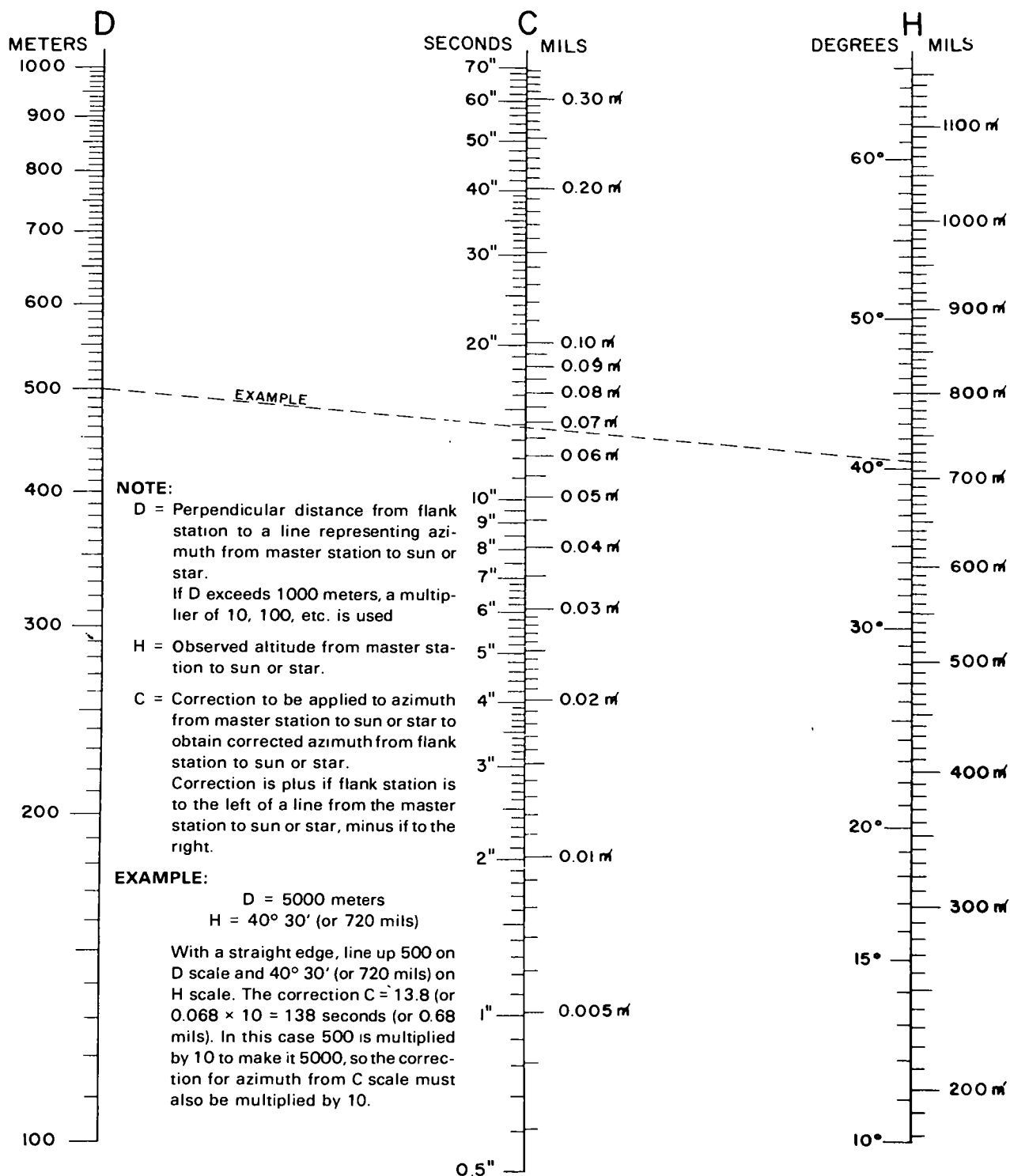


Table 14. Zone-to-Zone Azimuth Transformation

PURPOSE: The purpose of this table is to provide a method for the conversion of UTM grid azimuths in one zone into the corresponding azimuths at an adjacent zone. The table is designed for use in the area between the respective central meridians of the adjacent zones; however, it will yield accurate results a moderate distance outside this area. Results are in mils.

GUIDE FOR USE:

1. Coordinates must be transformed to the adjacent zone by use of TM 5-241-2 or other means.
2. The northing coordinates in each zone are added together. This "total northing" (N) is rounded to the nearest 100 (4th order) or 1000 (5th order). In the Southern Hemisphere the total N must be subtracted from 20,000,000 before entering the table.
3. Find the tabulated Ns between which the total N lies, subtract the lower tabulated N from the total N and move the decimal five places to the left.
4. Multiply this by the "DIFF IN C" located opposite the lower tabulated N.
5. Add this product to the "C" opposite the lower tabulated value. In 5th order computations, this is the change in azimuth; 4th order accuracy requires the following steps.
6. Subtract the smaller of the 2 Ns of the point from the larger, round to the nearest 100, and move the decimal three places to the left. If the resulting number is smaller than the "ALLOWABLE DIFF IN N" opposite the lower tabulated N, no further computations are required and the result from 5 above is the correct change in azimuth. If it is larger, complete the following steps.
7. Square the computed number.
8. Extract from the table the F closest the total N, multiply it by the squared number, round to nearest whole number and move the decimal three places to the left.
9. Add the resulting number to the result of 5 above. The sum is the change in azimuth.
10. The sign of the change in azimuth is determined by use of the following chart:

When the point is transformed from:

(Northern Hemisphere)
 East to West, sign is -
 West to East, sign is +

(Southern Hemisphere)
 East to West, sign is +
 West to East, sign is -

Table 14. Zone-to-Zone Azimuth Transformation —Continued

Example of a 5th Order Accuracy:

Required: Change in azimuth (C) to nearest 0.1 m.

Known: N (Zone 15) = 3833384

N (Zone 14) = 3830861

$3833384 + 3830861 = 7664245$; round to 7664000, which lies between 7600000 and 7700000 in the table.

$7664000 - 7600000 = 64000$; moving the decimal five places to the left yields 0.64.

N	C	DIFF IN C
7 600 000	60.157	.691

$$C = 60.157 + (0.64 \times .691) = 60.157 + .442 = 60.599$$

Rounded to the nearest 0.1 m, C = 60.6 m

Example of a 4th Order Accuracy:

Required: Change in azimuth (C) to nearest 0.001 m.

Known: N (Zone 15) = 3834767

N (Zone 14) = 3830679

$3834767 + 3830679 = 7665446$; round to 7665400, which lies between 7600000 and 7700000 in the table.

$7665400 - 7600000 = 65400$; moving the decimal five places to the left yields 0.654.

N	C	DIFF IN C	ALLOWABLE DIFF IN N	F
7 600 000	60.157	.691	1.53	0.21
7 700 000			1.54	0.21

$$C = 60.157 + (0.654 \times .691) = 60.157 + .452 = 60.609 \text{ m}$$

$3834767 - 3830679 = 4088$; rounding to the nearest 100 and moving the decimal three places to the left yields 4.1, which is larger than the closest ALLOWABLE DIFF IN N (1.54). Therefore, further computations are required.

$4.1 \text{ squared} = 4.1 \times 4.1 = 16.8$; $16.8 \times F = 16.8 \times 0.21 = 3.53$; rounding to the nearest whole number and moving the decimal three places to the left yields .004.

$$C = 60.609 + .004 = 60.613 \text{ m}$$

N	C	DIFF IN C	ALLOWABLE DIF IN N	F
0	0.0	.842	★	★
100 000	0.842	.842	0.18	15.24
200 000	1.684	.841	0.26	7.62
300 000	2.525	.842	0.31	5.08
400 000	3.367	.841	0.36	3.81
500 000	4.208	.841	0.40	3.05
600 000	5.049	.841	0.44	2.54
700 000	5.890	.840	0.48	2.18
800 000	6.730	.840	0.51	1.91
900 000	7.570	.840	0.54	1.70
1 000 000	8.410	.838	0.57	1.53
1 100 000	9.248	.839	0.60	1.39
1 200 000	10.087	.837	0.63	1.27
1 300 000	10.924	.837	0.65	1.18
1 400 000	11.761	.837	0.68	1.09
1 500 000	12.598	.835	0.70	1.02
1 600 000	13.433	.835	0.72	0.96
1 700 000	14.268	.833	0.75	0.90
1 800 000	15.101	.833	0.77	0.85
1 900 000	15.934	.832	0.79	0.81
2 000 000	16.766	.830	0.81	0.77
2 100 000	17.596	.830	0.83	0.73
2 200 000	18.426	.828	0.85	0.70
2 300 000	19.254	.827	0.87	0.67
2 400 000	20.081	.826	0.88	0.64
2 500 000	20.907	.825	0.90	0.61
2 600 000	21.732	.823	0.92	0.59
2 700 000	22.555	.822	0.94	0.57
2 800 000	23.377	.820	0.95	0.55
2 900 000	24.197	.819	0.97	0.53
3 000 000	25.016	.817	0.99	0.51
3 100 000	25.833	.815	1.00	0.50
3 200 000	26.648	.814	1.02	0.48
3 300 000	27.462	.812	1.03	0.47
3 400 000	28.274	.810	1.05	0.45
3 500 000	29.084	.809	1.06	0.44
3 600 000	29.893	.806	1.08	0.43
3 700 000	30.699	.805	1.09	0.42
3 800 000	31.504	.803	1.11	0.41
3 900 000	32.307	.800	1.12	0.40
4 000 000	33.107	.799	1.14	0.39
4 100 000	33.906	.796	1.15	0.38
4 200 000	34.702	.794	1.16	0.37
4 300 000	35.496	.792	1.18	0.36
4 400 000	36.288	.790	1.19	0.35
4 500 000	37.078	.787	1.20	0.35
4 600 000	37.865	.785	1.22	0.34
4 700 000	38.650	.782	1.23	0.33
4 800 000	39.432	.780	1.24	0.33
4 900 000	40.212	.778	1.25	0.32
5 000 000	40.990	.774	1.26	0.31
5 100 000	41.764	.773	1.28	0.31
5 200 000	42.537	.769	1.29	0.30
5 300 000	43.306	.767	1.30	0.30
5 400 000	44.073	.764	1.31	0.29
5 500 000	44.837	.761	1.32	0.29
5 600 000	45.598	.758	1.33	0.28
5 700 000	46.356	.756	1.35	0.28
5 800 000	47.112	.752	1.36	0.27
5 900 000	47.864	.750	1.37	0.27
6 000 000	48.614	.746	1.38	0.26
6 100 000	49.360	.743	1.39	0.26
6 200 000	50.103	.740	1.40	0.26

★ F CORRECTION NOT REQUIRED

		ALLOWABLE		
N	C	DIFF IN C	DIF IN N	F
6 300 000	50.843	.737	1.41	0.25
6 400 000	51.580	.734	1.42	0.25
6 500 000	52.314	.730	1.43	0.25
6 600 000	53.044	.727	1.44	0.24
6 700 000	53.771	.724	1.45	0.24
6 800 000	54.495	.720	1.46	0.24
6 900 000	55.215	.717	1.47	0.23
7 000 000	55.932	.713	1.48	0.23
7 100 000	56.645	.710	1.49	0.23
7 200 000	57.355	.706	1.50	0.22
7 300 000	58.061	.702	1.51	0.22
7 400 000	58.763	.699	1.52	0.22
7 500 000	59.462	.695	1.52	0.22
7 600 000	60.157	.691	1.53	0.21
7 700 000	60.848	.688	1.54	0.21
7 800 000	61.536	.683	1.55	0.21
7 900 000	62.219	.680	1.56	0.21
8 000 000	62.899	.675	1.57	0.20
8 100 000	63.574	.672	1.58	0.20
8 200 000	64.246	.668	1.59	0.20
8 300 000	64.914	.664	1.59	0.20
8 400 000	65.578	.659	1.60	0.20
8 500 000	66.237	.656	1.61	0.19
8 600 000	66.893	.651	1.62	0.19
8 700 000	67.544	.647	1.63	0.19
8 800 000	68.191	.643	1.63	0.19
8 900 000	68.834	.638	1.64	0.19
9 000 000	69.472	.634	1.65	0.18
9 100 000	70.106	.630	1.66	0.18
9 200 000	70.736	.625	1.66	0.18
9 300 000	71.361	.621	1.67	0.18
9 400 000	71.982	.616	1.68	0.18
9 500 000	72.598	.612	1.69	0.18
9 600 000	73.210	.608	1.69	0.17
9 700 000	73.818	.602	1.70	0.17
9 800 000	74.420	.598	1.71	0.17
9 900 000	75.018	.594	1.71	0.17
10 000 000	75.612	.588	1.72	0.17
10 100 000	76.200	.584	1.73	0.17
10 200 000	76.784	.579	1.74	0.17
10 300 000	77.363	.575	1.74	0.17
10 400 000	77.938	.569	1.75	0.16
10 500 000	78.507	.565	1.75	0.16
10 600 000	79.072	.560	1.76	0.16
10 700 000	79.632	.554	1.77	0.16
10 800 000	80.186	.550	1.77	0.16
10 900 000	80.736	.545	1.78	0.16
11 000 000	81.281	.539	1.79	0.16
11 100 000	81.820	.535	1.79	0.16
11 200 000	82.355	.530	1.80	0.16
11 300 000	82.885	.524	1.80	0.15
11 400 000	83.409	.519	1.81	0.15
11 500 000	83.928	.514	1.82	0.15
11 600 000	84.442	.509	1.82	0.15
11 700 000	84.951	.503	1.83	0.15
11 800 000	85.454	.498	1.83	0.15
11 900 000	85.952	.493	1.84	0.15
12 000 000	86.445	.488	1.84	0.15
12 100 000	86.933	.482	1.85	0.15
12 200 000	87.415	.477	1.85	0.15
12 300 000	87.892	.471	1.86	0.15
12 400 000	88.363	.466	1.86	0.14
12 500 000	88.829	.460	1.87	0.14

		ALLOWABLE		
N	C	DIFF IN C	DIF IN N	F
12 600 000	89.289	.455	1.87	0.14
12 700 000	89.744	.449	1.88	0.14
12 800 000	90.193	.444	1.88	0.14
12 900 000	90.637	.438	1.89	0.14
13 000 000	91.075	.432	1.89	0.14
13 100 000	91.507	.427	1.90	0.14
13 200 000	91.934	.421	1.90	0.14
13 300 000	92.355	.416	1.91	0.14
13 400 000	92.771	.409	1.91	0.14
13 500 000	93.180	.404	1.91	0.14
13 800 000	93.584	.399	1.92	0.14
13 700 000	93.983	.392	1.92	0.14
13 800 000	94.375	.386	1.93	0.14
13 900 000	94.761	.381	1.93	0.13
14 000 000	95.142	.375	1.94	0.13
14 100 000	95.517	.369	1.94	0.13
14 200 000	95.886	.363	1.94	0.13
14 300 000	96.249	.357	1.95	0.13
14 400 000	96.606	.352	1.95	0.13
14 500 000	96.958	.345	1.95	0.13
14 600 000	97.303	.339	1.96	0.13
14 700 000	97.642	.333	1.96	0.13
14 800 000	97.975	.328	1.96	0.13
14 900 000	98.303	.321	1.97	0.13
15 000 000	98.624	.315	1.97	0.13
15 100 000	98.939	.309	1.97	0.13
15 200 000	99.248	.303	1.98	0.13
15 300 000	99.551	.297	1.98	0.13
15 400 000	99.848	.290	1.98	0.13
15 500 000	100.138	.285	1.99	0.13
15 600 000	100.423	.278	1.99	0.13
15 700 000	100.701	.273	1.99	0.13
15 800 000	100.974	.266	1.99	0.13
15 900 000	101.240	.259	2.00	0.13
16 000 000	101.499	.254	2.00	0.13
16 100 000	101.753	.247	2.00	0.13
16 200 000	102.000	.241	2.00	0.12
16 300 000	102.241	.235	2.01	0.12
16 400 000	102.476	.229	2.01	0.12
16 500 000	102.705	.222	2.01	0.12
16 600 000	102.927	.216	2.01	0.12
16 700 000	103.143	.209	2.02	0.12
16 800 000	103.352	.204	2.02	0.12
16 900 000	103.556	.196	2.02	0.12
17 000 000	103.752	.191	2.02	0.12
17 100 000	103.943	.184	2.02	0.12
17 200 000	104.127	.178	2.03	0.12
17 300 000	104.305	.171	2.03	0.12
17 400 000	104.476	.165	2.03	0.12
17 500 000	104.641	.159	2.03	0.12
17 600 000	104.800	.152	2.03	0.12
17 700 000	104.952	.146	2.03	0.12
17 800 000	105.098	.139	2.04	0.12
17 900 000	105.237	.133	2.04	0.12
18 000 000	105.370		2.04	0.12



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By Order of the Secretary of the Army:

JOHN A. WICKHAM, JR.
General, United States Army
Chief of Staff

Official:

R. L. DILWORTH
Brigadier General, United States Army
The Adjutant General

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5/5 change 1; 7 April 1988

FM 6-300

Table 10a (1). Apparent Places of Stars, 1988 (Degrees)—Continued

Star No.	Right ascen- sion Declina- tion (°)	(Hr Min)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
50	RA DEC	14 05 36 18	57.5 36	58.7 41	59.7 47	60.5 54	60.8 59	60.9 63	60.8 65	60.3 65	59.8 62	59.5 58	59.7 55	60.4 53	61.4 55
51	RA DEC	14 15 19 14	06.4 28	07.5 21	08.4 19	09.0 20	09.3 24	09.4 29	09.2 32	08.8 34	08.4 33	08.1 30	08.2 24	08.6 16	09.5 07
52	RA DEC	14 38 60 47	44.7 02	46.6 04	48.2 09	49.4 18	50.1 26	50.3 34	49.9 39	49.1 41	48.0 39	47.3 34	47.2 26	47.9 21	49.4 18
53	RA DEC	14 50 15 59	11.9 35	13.0 41	14.0 45	14.7 49	15.2 50	15.4 51	15.4 50	15.1 49	14.7 48	14.3 46	14.4 46	14.8 48	15.7 52
54	RA DEC	14 50 74 11	42.5 53	45.1 48	47.5 48	49.5 54	50.2 63	49.6 73	48.0 79	45.8 80	43.4 77	41.5 70	40.5 59	40.7 47	42.4 37
55	RA DEC	15 34 26 44	09.9 62	10.9 54	11.9 51	12.7 53	13.3 58	13.5 65	13.5 71	13.1 74	12.6 75	12.1 72	11.9 66	12.1 58	12.7 49
56	RA DEC	15 59 22 35	36.1 21	37.2 24	38.2 28	39.1 31	39.8 32	40.3 33	40.4 34	40.2 34	39.8 33	39.3 32	39.2 31	39.4 31	40.1 32
57	RA DEC	16 28 26 24	38.9 26	39.9 28	40.9 31	41.9 33	42.7 35	43.3 36	43.5 38	43.4 38	42.9 38	42.4 37	42.2 35	42.3 34	43.0 35
58	RA DEC	16 47 69 00	19.6 25	21.7 21	24.0 20	26.4 23	28.2 29	29.5 37	29.9 44	29.3 51	28.0 53	26.5 52	25.6 46	25.6 38	26.7 31
59	RA DEC	17 09 15 42	40.0 45	40.8 47	41.8 50	42.7 51	43.5 51	44.2 49	44.5 48	44.5 48	44.1 47	43.6 47	43.3 47	43.3 47	43.8 49
60	RA DEC	17 32 37 05	46.0 51	46.9 50	48.0 50	49.2 51	50.2 52	51.1 54	51.5 57	51.5 60	51.1 61	50.5 61	50.1 59	50.0 56	50.5 54
61	RA DEC	17 34 12 33	21.3 54	22.1 48	22.9 44	23.8 43	24.6 47	25.3 52	25.6 58	25.5 63	25.1 66	24.6 66	24.2 64	24.1 59	24.4 52
62	RA DEC	17 56 51 28	17.5 72	18.2 62	19.2 56	20.5 55	21.6 60	22.3 69	22.6 79	22.3 88	21.4 93	20.4 94	19.5 90	19.0 82	19.0 72
63	RA DEC	18 23 34 23	21.0 37	21.8 35	22.8 34	23.9 33	25.0 33	25.9 33	26.6 35	26.7 37	26.4 39	25.9 40	25.4 39	25.2 37	25.5 35
64	RA DEC	18 36 38 45	30.1 70	30.7 61	31.5 54	32.5 53	33.5 57	34.3 65	34.8 74	34.7 83	34.3 89	33.6 91	32.8 89	32.4 83	32.4 74
65	RA DEC	18 54 26 18	29.9 55	30.6 54	31.4 53	32.4 52	33.4 50	34.4 48	35.0 48	35.3 49	35.1 50	34.6 51	34.1 51	33.9 50	34.1 49
66	RA DEC	19 50 08 49	10.6 62	10.9 57	11.5 54	12.3 53	13.2 56	14.1 62	14.8 68	15.2 74	15.1 79	14.7 81	14.2 80	13.9 78	13.8 73
67	RA DEC	20 24 56 46	40.6 43	41.0 35	41.9 28	43.2 22	44.8 18	46.4 17	47.7 19	48.4 24	48.4 30	47.8 35	46.9 37	46.2 35	45.8 29
68	RA DEC	20 40 45 13	59.4 74	59.4 65	59.8 58	60.7 53	61.8 53	62.9 59	63.8 68	64.2 79	64.1 88	63.6 95	62.8 97	62.1 95	61.6 89
69	RA DEC	21 40 77 26	08.5 58	07.9 48	08.8 38	11.0 28	14.0 21	17.5 18	20.8 20	23.1 26	23.6 34	22.5 42	20.2 46	17.6 46	15.6 40
70	RA DEC	22 07 47 00	28.3 87	28.2 81	28.5 75	29.1 66	30.2 59	31.5 54	32.8 51	33.8 53	34.2 57	34.1 63	33.5 67	32.9 69	32.4 67
71	RA DEC	22 42 30 09	25.3 35	25.1 30	25.1 25	25.5 20	26.3 20	27.3 23	28.4 30	29.2 39	29.6 47	29.6 54	29.3 59	28.9 59	28.4 56
72	RA DEC	22 56 29 40	59.1 82	59.0 80	59.0 76	59.4 70	60.1 63	61.2 56	62.3 51	63.2 49	63.7 50	63.8 53	63.6 57	63.2 60	62.8 61
73	RA DEC	23 04 15 08	09.1 28	08.9 24	08.9 21	09.3 19	09.9 20	10.9 25	11.9 32	12.7 39	13.2 45	13.3 50	13.1 52	12.8 52	12.4 49

Table 10a (2). Apparent Places of Stars, 1989 (Degrees)

Star No.	Right ascen- sion Declina- tion (°')	(Hr Min)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
1	RA DEC	00 07 29 01	48.9 59	48.6 55	48.4 51	48.5 47	49.1 45	50.0 47	51.1 52	52.1 60	52.8 68	53.1 74	53.1 79	52.8 81	52.4 81
2	RA DEC	00 08 59 05	34.4 41	33.5 37	33.0 30	33.1 22	33.9 17	35.2 15	36.9 18	38.4 26	39.3 36	39.7 46	39.6 55	39.0 61	38.1 63
3	RA DEC	00 25 77 18	13.6 75	11.1 70	09.6 61	09.3 49	10.4 38	12.7 29	15.6 24	18.9 24	21.3 29	22.2 38	21.3 47	19.3 52	16.6 53
4	RA DEC	00 25 42 21	45.3 68	44.8 66	44.5 61	44.5 53	45.0 43	45.9 34	47.1 28	48.2 25	49.1 27	49.5 32	49.4 39	49.0 44	48.5 47
5	RA DEC	00 39 56 28	52.4 58	51.5 55	51.0 50	50.9 42	51.5 36	52.7 34	54.2 36	55.7 43	56.8 52	57.4 62	57.4 71	57.1 77	56.3 80
6	RA DEC	00 43 18 02	02.9 53	02.5 53	02.3 51	02.3 47	02.7 41	03.4 33	04.4 27	05.4 21	06.2 20	06.6 21	06.6 25	06.5 28	06.2 31
7	RA DEC	00 56 60 39	02.1 48	01.1 46	0 .3 41	0 .2 33	0 .7 26	02.0 23	03.7 24	05.4 30	06.6 39	07.3 49	07.5 59	07.1 66	06.3 69
8	RA DEC	01 25 60 10	05.6 65	04.6 64	03.8 59	03.5 52	03.9 45	05.1 41	06.7 41	08.4 46	09.8 54	10.7 63	11.0 73	10.8 80	10.1 85
9	RA DEC	01 37 57 16	20.1 105	19.1 104	18.3 99	17.9 90	18.0 79	18.7 68	19.9 60	21.4 56	22.7 58	23.5 64	23.7 73	23.3 81	22.4 85
10			SEE TABLE 11. APPARENT PLACES OF POLARIS, 1989												
11	RA DEC	02 06 23 24	33.9 51	33.5 50	33.1 48	32.9 45	33.1 44	33.7 45	34.6 48	35.7 53	36.7 59	37.3 63	37.7 67	37.8 69	37.7 69
12	RA DEC	02 57 40 20	52.3 59	51.7 62	51.1 61	50.5 56	50.4 47	50.7 37	51.4 28	52.5 21	53.6 19	54.4 22	55.0 29	55.1 38	54.8 44
13	RA DEC	03 01 04 02	43.4 57	43.1 54	42.7 53	42.4 54	42.4 56	42.7 59	43.5 64	44.5 69	45.4 74	46.1 75	46.7 75	46.9 73	46.9 71
14	RA DEC	03 23 49 49	33.6 41	33.0 43	32.4 42	31.8 38	31.6 32	32.1 28	33.1 25	34.5 26	35.9 30	37.1 36	38.0 42	38.4 48	38.4 53
15	RA DEC	04 35 16 29	19.0 26	18.8 25	18.4 24	17.9 24	17.7 24	17.8 24	18.4 26	19.3 29	20.2 32	21.1 33	22.0 34	22.5 33	22.8 32
16	RA DEC	05 14 08 12	02.2 44	02.1 48	01.7 50	01.2 50	0 .8 48	0 .8 43	01.2 38	02.0 32	02.8 28	03.7 28	04.5 31	05.1 36	05.4 41
17	RA DEC	05 15 45 59	54.9 28	54.7 32	54.2 34	53.5 33	53.0 30	53.0 25	53.6 21	54.7 19	55.9 19	57.2 20	58.4 22	59.3 26	59.8 31
18	RA DEC	05 24 06 20	34.2 33	34.1 30	33.7 29	33.2 29	32.9 30	32.9 32	33.3 35	34.1 38	34.9 41	35.8 42	36.7 40	37.4 38	37.7 35
19	RA DEC	05 25 28 36	37.7 06	37.6 07	37.3 08	36.7 07	36.3 06	36.3 04	36.8 03	37.7 03	38.7 04	39.7 05	40.7 06	41.5 06	41.9 08
20	RA DEC	05 35 01 12	41.0 24	41.0 27	40.6 29	40.1 29	39.8 27	39.7 24	40.1 20	40.8 16	41.6 12	42.5 12	43.3 14	44.0 18	44.4 23
21	RA DEC	05 40 01 56	13.9 46	13.9 50	13.5 52	13.0 52	12.7 50	12.6 47	12.9 43	13.6 38	14.5 35	15.3 35	16.2 37	16.9 41	17.3 46
22	RA DEC	05 54 07 24	36.4 27	36.4 25	36.1 24	35.6 24	35.2 24	35.1 26	35.4 29	36.1 32	37.0 34	37.8 34	38.7 33	39.5 30	40.0 26
23	RA DEC	06 23 52 40	44.9 76	44.6 86	43.9 92	42.8 94	41.8 91	41.2 84	41.1 75	41.7 65	42.6 58	43.8 56	45.1 60	46.0 69	46.4 80
24	RA DEC	06 37 16 24	06.5 40	06.7 38	06.4 38	06.0 38	05.5 39	05.3 39	05.6 40	06.2 41	07.0 41	07.9 41	08.9 39	09.7 36	10.4 34
25	RA DEC	06 44 16 41	41.6 56	41.7 63	41.4 67	40.8 69	40.3 67	40.1 63	40.2 57	40.7 51	41.4 47	42.2 46	43.2 49	44.0 55	44.5 63

Table 10a (2). Apparent Places of Stars, 1989 (Degrees)—Continued

Star No.	Right Ascension Declination (° ')	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH													
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	
		Seconds (time of RA or arc of declination)													
26	RA DEC	06 58 28 57	13.4 17	13.5 26	13.2 31	12.5 34	12.0 32	11.6 27	11.6 20	12.0 13	12.7 07	13.6 05	14.6 08	15.5 15	16.0 24
27	RA DEC	07 07 26 22	58.4 24	58.5 33	58.2 38	57.7 41	57.1 39	56.7 35	56.7 28	57.1 21	57.8 15	58.7 13	59.6 16	60.5 23	61.1 32
28	RA DEC	07 33 31 54	56.2 50	56.5 51	56.4 54	55.9 55	55.4 56	55.0 55	55.1 53	55.6 50	56.4 47	57.3 45	58.4 42	59.5 40	60.3 40
29	RA DEC	07 38 05 15	45.4 18	45.7 14	45.6 12	45.2 12	44.7 12	44.4 14	44.5 16	44.8 18	45.4 19	46.2 19	47.2 15	48.1 11	48.8 06
30	RA DEC	07 44 28 03	40.7 14	41.1 15	41.0 16	40.6 18	40.1 19	39.7 18	39.8 17	40.2 15	40.9 12	41.8 10	42.8 07	43.9 04	44.8 03
31	RA DEC	08 09 47 17	13.5 64	13.7 75	13.4 84	12.7 89	11.9 90	11.1 87	10.8 81	10.9 72	11.4 64	12.3 59	13.5 60	14.7 67	15.6 77
32	RA DEC	08 22 59 28	19.5 14	19.8 26	19.3 36	18.3 43	17.1 45	16.0 42	15.4 35	15.3 26	15.8 17	16.9 12	18.4 12	19.9 18	20.9 28
33	RA DEC	09 07 43 23	36.9 05	37.5 16	37.4 25	37.0 32	36.3 35	35.6 34	35.2 29	35.1 21	35.4 14	36.1 08	37.2 08	38.4 13	39.4 22
34	RA DEC	09 13 69 40	07.2 04	08.0 16	07.6 26	06.4 36	04.7 40	03.0 40	01.6 36	01.0 27	01.2 18	02.4 11	04.4 08	06.5 12	08.2 21
35	RA DEC	09 27 08 36	04.2 35	04.8 42	04.9 46	04.7 49	04.3 50	04.0 48	03.8 45	03.8 42	04.1 39	04.7 38	05.5 40	06.5 46	07.4 53
36	RA DEC	10 07 12 00	48.6 73	49.4 69	49.7 68	49.6 68	49.3 70	48.9 72	48.7 73	48.7 73	48.8 72	49.3 69	50.1 65	51.1 59	52.1 53
37	RA DEC	11 01 56 25	13.3 72	14.6 74	15.2 79	15.3 86	14.7 93	13.9 96	13.1 94	12.7 89	12.6 81	13.0 71	14.0 62	15.4 54	17.1 51
38	RA DEC	11 03 61 47	06.0 80	07.5 82	08.2 88	08.2 96	07.6 102	06.5 105	05.6 103	05.0 97	04.9 89	05.3 79	06.4 69	08.0 61	09.8 58
39	RA DEC	11 48 14 37	30.8 52	31.8 47	32.3 46	32.6 47	32.5 49	32.2 52	31.9 54	31.7 54	31.6 53	31.7 49	32.2 44	33.1 37	34.2 30
40	RA DEC	11 53 53 44	16.9 62	18.3 61	19.1 65	19.4 72	19.1 79	18.4 84	17.7 85	17.1 81	16.8 74	16.9 65	17.5 54	18.7 45	20.2 39
41	RA DEC	12 15 17 28	14.7 50	15.7 57	16.4 63	16.7 68	16.7 71	16.5 71	16.2 70	15.9 68	15.7 65	15.8 62	16.2 62	17.1 65	18.2 72
42	RA DEC	12 25 63 02	58.5 03	60.3 11	61.3 20	61.9 31	61.7 41	61.1 47	60.2 49	59.2 47	58.4 40	58.3 32	59.0 25	60.5 22	62.4 25
43	RA DEC	12 30 57 02	32.8 53	34.3 61	35.3 70	35.8 81	35.8 89	35.3 95	34.6 97	33.8 95	33.2 89	33.1 81	33.7 75	35.0 72	36.6 75
44	RA DEC	12 47 59 37	03.9 31	05.6 37	06.7 46	07.3 57	07.4 66	06.9 72	06.2 75	05.3 73	04.6 68	04.3 60	04.9 53	06.2 50	08.0 52
45	RA DEC	12 53 56 00	33.8 48	35.3 45	36.4 48	37.0 55	36.9 63	36.3 70	35.5 72	34.7 70	34.1 64	33.8 55	34.1 44	35.1 34	36.5 26
46	RA DEC	13 23 54 58	29.6 35	31.1 31	32.2 33	32.9 40	33.0 48	32.5 55	31.8 59	31.0 58	30.3 53	29.9 45	30.0 34	30.8 23	32.1 15
47	RA DEC	13 24 11 06	36.8 18	37.8 24	38.6 29	39.2 33	39.4 34	39.3 34	39.1 33	38.8 31	38.5 29	38.4 28	38.6 29	39.3 32	40.3 38
48	RA DEC	13 47 49 21	06.7 43	08.1 38	09.1 39	09.9 45	10.1 53	09.8 60	09.2 65	08.5 65	07.8 61	07.4 54	07.4 44	08.0 33	09.2 24
49	RA DEC	14 03 60 19	01.2 04	03.1 07	04.5 14	05.7 23	06.2 32	06.2 40	05.7 44	04.8 45	03.9 42	03.3 35	03.5 28	04.4 23	06.1 22

Table 10a (2). Apparent Places of Stars, 1989 (Degrees)—Continued

Star No.	Right ascen- sion Declina- tion (°)	(Hr Min)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
50	RA DEC	14 06 36 18	01.4 55	02.7 60	03.7 66	04.5 73	04.8 78	04.9 82	04.7 84	04.3 84	03.8 81	03.5 77	03.6 73	04.3 71	05.4 73
51	RA DEC	14 15 19 13	09.5 67	10.5 61	11.4 59	12.1 60	12.4 64	12.4 69	12.2 73	11.8 74	11.4 74	11.1 70	11.1 64	11.6 57	12.5 48
52	RA DEC	14 38 60 47	49.4 18	51.3 20	52.8 25	54.1 33	54.8 42	55.0 49	54.6 55	53.8 57	52.7 55	51.9 49	51.8 42	52.6 36	54.1 33
53	RA DEC	14 50 15 59	15.7 52	16.7 56	17.6 61	18.4 64	18.9 66	19.1 66	19.1 66	18.8 65	18.4 63	18.0 62	18.0 61	18.5 63	19.3 67
54	RA DEC	14 50 74 11	42.4 37	44.9 32	47.2 32	49.1 38	49.9 47	49.3 57	47.7 63	45.4 65	43.1 62	41.2 55	40.1 44	40.3 32	41.9 22
55	RA DEC	15 34 26 44	12.7 49	13.7 42	14.7 39	15.5 40	16.1 45	16.3 52	16.3 58	15.9 62	15.4 63	14.8 60	14.6 54	14.8 46	15.5 37
56	RA DEC	15 59 22 35	40.1 32	41.1 35	42.1 38	43.1 41	43.8 43	44.2 44	44.4 44	44.2 44	43.7 44	43.3 42	43.0 40	43.3 40	44.1 42
57	RA DEC	16 28 26 24	43.0 35	44.0 36	45.0 39	46.0 41	46.8 43	47.4 44	47.6 45	47.5 46	47.0 46	46.5 44	46.2 42	46.4 41	47.1 42
58	RA DEC	16 47 69 00	26.7 31	28.8 27	31.0 26	33.5 29	35.4 35	36.6 43	37.0 50	36.5 56	35.1 59	33.6 57	32.6 51	32.6 44	33.8 37
59	RA DEC	17 09 15 42	43.8 49	44.6 52	45.5 54	46.5 55	47.4 54	48.0 53	48.3 52	48.3 51	47.9 51	47.4 50	47.0 50	47.1 50	47.6 52
60	RA DEC	17 32 37 05	50.5 54	51.5 52	52.5 52	53.7 53	54.8 54	55.6 56	56.0 58	56.1 61	55.6 63	55.0 62	54.5 60	54.5 57	55.0 55
61	RA DEC	17 34 12 33	24.4 52	25.2 46	26.0 42	26.9 42	27.7 45	28.3 51	28.7 57	28.6 62	28.2 64	27.7 65	27.2 62	27.2 58	27.5 51
62	RA DEC	17 56 51 28	19.0 72	19.7 62	20.7 56	22.0 56	23.1 61	23.9 70	24.1 80	23.8 89	23.0 94	22.0 95	21.0 91	20.5 84	20.6 73
63	RA DEC	18 23 34 23	25.5 35	26.2 32	27.2 31	28.3 30	29.4 30	30.3 30	30.9 32	31.1 34	30.8 36	30.2 36	29.7 35	29.5 33	29.8 31
64	RA DEC	18 36 38 45	32.4 74	32.9 65	33.7 59	34.8 58	35.8 61	36.6 69	37.0 79	37.0 88	36.5 94	35.8 96	35.1 94	34.6 89	34.7 79
65	RA DEC	18 54 26 18	34.1 49	34.7 48	35.5 47	36.5 45	37.5 44	38.4 42	39.1 42	39.4 42	39.2 44	38.7 44	38.2 44	37.9 43	38.1 43
66	RA DEC	19 50 08 50	13.8 13	14.2 09	14.7 05	15.6 05	16.5 08	17.4 13	18.0 20	18.4 26	18.3 30	17.9 32	17.4 32	17.1 30	17.1 25
67	RA DEC	20 24 56 46	45.8 29	46.2 22	47.0 15	48.4 08	50.0 04	51.5 03	52.8 05	53.6 10	53.6 16	52.9 21	52.0 23	51.2 21	51.0 15
68	RA DEC	20 41 45 14	01.6 29	01.7 20	02.1 12	03.0 08	04.1 08	05.2 14	06.1 23	06.6 34	06.4 43	05.9 50	05.1 53	04.4 51	04.0 44
69	RA DEC	21 40 77 26	15.6 40	14.9 30	15.7 20	17.9 10	21.0 03	24.5 00	27.7 01	30.0 07	30.6 15	29.4 23	27.0 28	24.4 27	22.4 21
70	RA DEC	22 07 47 00	32.4 67	32.3 62	32.5 55	33.2 47	34.3 39	35.6 34	36.8 31	37.8 33	38.3 37	38.1 43	37.6 48	36.9 49	36.5 47
71	RA DEC	22 42 30 09	28.4 56	28.2 51	28.3 46	28.7 42	29.4 41	30.5 44	31.5 51	32.4 60	32.8 69	32.8 75	32.4 80	32.0 80	31.6 78
72	RA DEC	22 57 29 40	02.8 61	02.6 59	02.6 55	03.0 48	03.8 41	04.8 34	05.8 29	06.8 27	07.3 28	07.4 32	07.1 36	06.7 39	06.4 39
73	RA DEC	23 04 15 08	12.4 49	12.2 46	12.2 43	12.6 41	13.3 42	14.2 47	15.2 53	16.0 61	16.5 67	16.6 71	16.4 74	16.1 74	15.8 71

Table 10a (3). Apparent Places of Stars, 1990 (Degrees)—Continued

Star No.	Right Ascension Declination (° ')	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
		Seconds (time of RA or arc of declination)												
50	RA DEC 14 06 -36 19	05.4 13	06.6 18	07.6 24	08.4 31	08.8 36	08.9 40	08.6 42	08.2 42	07.7 39	07.4 35	07.5 31	08.2 29	09.3 31
51	RA DEC 14 15 19 13	12.5 48	13.5 42	14.4 40	15.0 41	15.3 45	15.4 50	15.1 54	14.8 56	14.3 55	14.0 52	14.0 46	14.5 38	15.4 30
52	RA DEC 14 38 -60 47	54.1 33	55.9 35	57.5 40	58.8 48	59.6 57	59.7 64	59.3 70	58.4 71	57.4 69	56.6 64	56.5 56	57.2 50	58.8 47
53	RA DEC 14 50 -16 00	19.3 07	20.4 12	21.3 16	22.1 19	22.6 21	22.8 21	22.7 21	22.4 19	22.0 18	21.7 17	21.6 16	22.0 17	22.9 21
54	RA DEC 14 50 74 11	41.9 22	44.4 17	46.8 17	48.7 24	49.4 33	48.8 42	47.2 48	45.0 51	42.6 48	40.7 40	39.6 30	39.8 18	41.3 08
55	RA DEC 15 34 26 44	15.5 37	16.5 30	17.4 27	18.3 29	18.8 34	19.1 41	19.0 47	18.6 51	18.1 52	17.6 49	17.3 43	17.5 35	18.2 26
56	RA DEC 15 59 -22 35	44.1 42	45.1 45	46.0 48	47.0 50	47.7 52	48.1 53	48.2 54	48.0 53	47.6 52	47.1 51	46.9 50	47.1 49	47.9 50
57	RA DEC 16 28 -26 24	47.1 42	48.0 43	49.0 46	50.1 48	50.9 50	51.4 51	51.6 52	51.5 52	51.0 52	50.5 51	50.2 49	50.4 48	51.0 48
58	RA DEC 16 47 -69 00	33.8 37	35.9 32	38.1 32	40.5 34	42.5 40	43.7 48	44.0 55	43.5 61	42.2 64	40.7 62	39.6 56	39.6 48	40.8 41
59	RA DEC 17 09 -15 42	47.6 52	48.4 55	49.3 57	50.3 58	51.1 57	51.8 56	52.1 55	52.0 54	51.6 53	51.1 53	50.8 53	50.8 53	51.3 55
60	RA DEC 17 32 -37 05	55.0 55	55.9 53	57.0 53	58.2 53	59.2 55	60.0 57	60.5 59	60.5 61	60.1 63	59.5 63	58.9 61	58.9 57	59.4 55
61	RA DEC 17 34 12 33	27.5 51	28.2 45	29.0 41	30.0 41	30.8 44	31.4 50	31.7 56	31.6 61	31.2 64	30.7 64	30.2 62	30.1 57	30.5 51
62	RA DEC 17 56 51 28	20.6 73	21.3 63	22.3 58	23.5 57	24.6 62	25.4 71	25.6 81	25.3 90	24.5 96	23.5 97	22.5 93	22.0 86	22.1 75
63	RA DEC 18 23 -34 23	29.8 31	30.6 29	31.5 27	32.6 26	33.7 26	34.7 26	35.2 28	35.4 30	35.1 31	34.6 32	34.0 31	33.8 29	34.1 26
64	RA DEC 18 36 38 46	34.7 19	35.1 10	35.9 04	37.0 03	38.0 07	38.8 15	39.2 24	39.2 33	38.7 40	38.0 42	37.3 40	36.8 34	36.9 26
65	RA DEC 18 54 -26 18	38.1 43	38.7 41	39.5 40	40.5 38	41.6 37	42.5 35	43.1 35	43.4 35	43.2 36	42.7 37	42.1 37	41.9 36	42.1 35
66	RA DEC 19 50 08 50	17.1 25	17.4 20	17.9 17	18.7 17	19.7 20	20.6 26	21.2 32	21.5 38	21.5 43	21.1 45	20.6 44	20.2 42	20.2 38
67	RA DEC 20 24 -56 45	51.0 75	51.3 68	52.1 61	53.4 54	55.0 50	56.6 49	57.8 51	58.5 56	58.5 61	57.9 66	56.9 68	56.1 66	55.9 61
68	RA DEC 20 41 45 14	04.0 44	04.0 35	04.4 28	05.3 23	06.4 24	07.5 30	08.4 39	08.9 49	08.8 59	08.2 66	07.4 68	06.7 66	06.3 60
69	RA DEC 21 40 -77 25	22.4 81	21.7 71	22.5 61	24.6 51	27.6 44	31.2 41	34.3 43	36.4 48	37.1 56	36.0 64	33.5 69	30.8 69	28.8 62
70	RA DEC 22 07 -47 00	36.5 47	36.3 42	36.5 35	37.2 27	38.3 19	39.6 14	40.8 12	41.7 13	42.2 17	42.1 23	41.5 28	40.8 29	40.3 27
71	RA DEC 22 42 30 10	31.6 18	31.4 12	31.4 07	31.8 03	32.6 02	33.6 06	34.6 12	35.5 21	35.9 30	35.9 37	35.6 41	35.1 41	34.7 39
72	RA DEC 22 57 -29 40	06.4 39	06.1 37	06.2 33	06.6 27	07.3 20	08.3 13	09.4 08	10.3 06	10.8 07	10.9 10	10.6 15	10.2 18	09.8 18
73	RA DEC 23 04 15 09	15.8 11	15.5 08	15.5 04	15.9 03	16.6 04	17.5 08	18.5 15	19.3 22	19.8 28	19.9 33	19.7 35	19.3 35	19.0 33

Table 10a (4). Apparent Places of Stars, 1991 (Degrees)

Star No.	Right ascen- sion Declina- tion	(Hr Min) (°')	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
1	RA DEC	00 07 29 02	55.9 42	55.5 38	55.3 34	55.4 29	55.9 28	56.8 30	57.9 35	58.9 42	59.6 50	59.9 56	59.9 61	59.6 63	59.2 62
2	RA DEC	00 08 59 05	41.9 84	40.9 80	40.4 73	40.5 65	41.3 59	42.7 57	44.3 60	45.7 68	46.7 78	47.2 88	47.0 97	46.4 103	45.5 104
3	RA DEC	00 25 -77 17	19.1 92	16.6 87	15.1 78	14.6 67	15.5 55	17.8 46	20.8 41	24.0 41	26.3 47	27.2 55	26.4 64	24.3 70	21.5 71
4	RA DEC	00 25 -42 20	51.5 86	51.0 84	50.7 79	50.6 71	51.1 62	52.0 53	53.1 46	54.2 44	55.1 46	55.5 51	55.4 58	55.0 63	54.4 66
5	RA DEC	00 39 56 29	60.3 40	59.4 38	58.8 32	58.7 24	59.3 18	60.6 16	62.0 18	63.5 24	64.6 33	65.2 43	65.3 52	64.8 58	64.1 60
6	RA DEC	00 43 -18 01	09.3 70	09.0 71	08.7 69	08.7 65	09.1 59	09.8 52	10.8 45	11.7 40	12.5 39	12.9 40	13.0 43	12.7 47	12.4 50
7	RA DEC	00 56 60 40	10.5 30	09.5 28	08.7 22	08.5 14	09.1 07	10.4 04	12.0 05	13.6 11	15.0 19	15.7 29	15.9 39	15.4 46	14.6 49
8	RA DEC	01 25 60 11	14.7 44	13.7 43	12.9 38	12.5 30	12.9 23	14.1 19	15.6 19	17.3 24	18.7 32	19.7 41	20.0 51	19.8 58	19.1 62
9	RA DEC	01 37 -57 16	24.6 67	23.6 66	22.8 61	22.3 52	22.3 42	23.1 31	24.3 23	25.7 19	27.0 21	27.8 27	28.0 36	27.5 44	26.7 49
10	SEE TABLE 11. APPARENT PLACES OF POLARIS, 1991														
11	RA DEC	02 06 23 25	41.4 26	41.0 25	40.6 22	40.3 19	40.5 18	41.1 19	42.0 22	43.0 27	44.0 32	44.7 37	45.1 40	45.2 42	45.0 42
12	RA DEC	02 57 -40 19	57.1 91	56.5 94	55.8 93	55.2 88	55.1 80	55.4 70	56.1 61	57.2 54	58.2 52	59.1 55	59.6 62	59.7 71	59.3 78
13	RA DEC	03 01 04 03	50.3 24	49.9 22	49.5 21	49.2 21	49.1 22	49.5 26	50.3 31	51.2 36	52.1 40	52.8 42	53.4 41	53.6 39	53.5 37
14	RA DEC	03 23 49 49	43.2 65	42.6 67	41.9 66	41.2 61	41.1 56	41.6 51	42.6 49	43.9 50	45.3 53	46.5 58	47.4 65	47.8 71	47.8 76
15	RA DEC	04 35 16 29	26.5 38	26.3 37	25.9 36	25.4 35	25.1 34	25.3 35	25.8 37	26.6 40	27.6 42	28.5 43	29.3 44	29.9 43	30.1 42
16	RA DEC	05 14 -08 12	08.5 39	08.4 43	08.0 46	07.4 46	07.0 44	07.0 39	07.4 34	08.1 28	08.9 25	09.8 24	10.6 27	11.2 32	11.5 38
17	RA DEC	05 16 45 59	04.6 32	04.4 36	03.9 37	03.1 36	02.6 33	02.6 28	03.2 24	04.2 22	05.4 21	06.7 22	07.9 25	08.8 28	09.2 33
18	RA DEC	05 24 06 20	41.2 35	41.1 33	40.7 32	40.2 31	39.8 32	39.8 34	40.2 37	40.9 40	41.8 43	42.7 43	43.5 42	44.2 39	44.5 36
19	RA DEC	05 25 28 36	46.0 08	45.9 09	45.5 10	44.9 09	44.5 07	44.6 06	45.0 05	45.8 05	46.8 05	47.8 06	48.8 07	49.5 07	49.9 08
20	RA DEC	05 35 -01 12	47.7 23	47.6 26	47.2 28	46.7 29	46.3 27	46.3 24	46.6 20	47.2 16	48.1 13	49.0 12	49.8 14	50.5 19	50.8 24
21	RA DEC	05 40 -01 56	20.5 47	20.5 50	20.1 52	19.5 53	19.2 51	19.1 48	19.4 44	20.0 39	20.9 36	21.8 36	22.6 38	23.3 42	23.6 48
22	RA DEC	05 54 07 24	43.4 24	43.5 22	43.1 21	42.6 20	42.2 21	42.1 23	42.4 25	43.0 28	43.9 30	44.8 30	45.7 29	46.4 26	46.8 22
23	RA DEC	06 23 -52 41	47.8 24	47.6 34	46.8 40	45.7 42	44.7 40	44.1 33	44.1 24	44.5 14	45.5 07	46.7 05	47.9 09	48.8 18	49.2 29
24	RA DEC	06 37 16 24	14.1 29	14.2 28	13.9 27	13.4 27	13.0 27	12.8 28	13.0 28	13.5 29	14.3 29	15.2 29	16.2 27	17.0 25	17.6 22
25	RA DEC	06 44 -16 42	47.4 11	47.4 18	47.1 22	46.6 23	46.0 22	45.8 18	45.9 13	46.3 07	47.0 02	47.9 01	48.8 04	49.6 11	50.1 19

Table 10a (4). Apparent Places of Stars, 1991 (Degrees)—Continued

Star No.	Right ascen- sion Declina- tion (°')	(Hr Min) (°')	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
26	RA DEC	06 58 -28 57	18.6 32	18.7 41	18.3 46	17.7 49	17.1 47	16.7 43	16.7 36	17.1 28	17.8 22	18.7 21	19.7 23	20.5 30	21.1 40
27	RA DEC	07 08 -26 22	03.8 41	03.9 49	03.6 55	03.0 57	02.4 56	02.0 52	02.0 45	02.4 38	03.0 33	03.9 31	04.9 33	05.7 40	06.3 50
28	RA DEC	07 34 -31 54	04.4 29	04.8 30	04.6 32	04.1 34	03.5 34	03.2 33	03.3 31	03.7 29	04.4 26	05.3 23	06.5 20	07.5 18	08.3 18
29	RA DEC	07 38 -05 14	52.2 54	52.5 50	52.4 48	51.9 48	51.4 48	51.2 49	51.2 51	51.5 54	52.1 55	52.9 54	53.8 51	54.7 47	55.4 42
30	RA DEC	07 44 -28 02	48.7 51	49.1 52	48.9 53	48.4 55	47.9 56	47.6 55	47.6 54	47.9 52	48.6 49	49.5 46	50.6 43	51.6 41	52.4 39
31	RA DEC	08 09 -47 18	17.6 31	17.9 42	17.6 50	16.9 56	16.0 57	15.3 54	15.0 47	15.0 39	15.5 31	16.5 26	17.7 27	18.8 33	19.7 44
32	RA DEC	08 22 -59 28	22.4 43	22.7 54	22.3 64	21.3 71	20.1 73	19.0 71	18.3 64	18.2 55	18.8 46	19.8 41	21.3 41	22.8 46	23.9 57
33	RA DEC	09 07 -43 23	41.9 40	42.4 51	42.4 60	41.9 67	41.2 70	40.6 69	40.2 64	40.0 56	40.3 48	41.1 43	42.1 42	43.3 47	44.3 57
34	RA DEC	09 13 -69 40	09.2 39	09.9 50	09.6 61	08.4 70	06.7 75	05.0 75	03.6 71	03.0 62	03.2 53	04.4 46	06.4 43	08.5 47	10.2 56
35	RA DEC	09 27 -08 37	10.6 11	11.2 18	11.4 23	11.1 26	10.7 26	10.4 25	10.1 22	10.1 18	10.4 15	11.0 15	11.8 17	12.8 22	13.7 29
36	RA DEC	10 07 -12 00	55.5 33	56.3 29	56.5 28	56.4 28	56.1 30	55.7 31	55.5 32	55.4 33	55.6 32	56.0 29	56.8 25	57.7 19	58.8 13
37	RA DEC	11 01 -56 25	20.7 29	22.0 31	22.6 36	22.6 44	22.0 50	21.2 53	20.4 52	19.9 47	19.8 39	20.2 29	21.2 19	22.5 12	24.1 08
38	RA DEC	11 03 -61 47	13.5 36	15.0 38	15.7 44	15.6 52	14.9 59	13.9 62	13.0 60	12.3 55	12.1 46	12.5 36	13.6 26	15.1 19	16.9 15
39	RA DEC	11 48 -14 36	37.4 68	38.3 63	38.9 62	39.1 63	39.0 66	38.7 68	38.4 70	38.1 71	38.0 70	38.1 66	38.6 61	39.5 54	40.5 47
40	RA DEC	11 53 -53 43	23.4 78	24.8 78	25.6 82	25.8 89	25.4 96	24.8 101	24.1 102	23.4 98	23.0 91	23.1 82	23.8 72	24.9 63	26.3 57
41	RA DEC	12 15 -17 29	21.5 33	22.5 40	23.1 46	23.4 51	23.4 53	23.2 54	22.9 53	22.6 50	22.4 47	22.5 45	22.9 45	23.7 47	24.8 53
42	RA DEC	12 26 -63 02	06.3 46	08.1 53	09.2 63	09.7 73	09.6 83	09.0 89	08.0 91	07.0 89	06.2 82	06.1 74	06.8 67	08.2 64	10.2 66
43	RA DEC	12 30 -57 03	40.5 36	42.0 44	43.0 53	43.5 63	43.4 72	43.0 78	42.3 80	41.4 77	40.8 71	40.8 63	41.3 57	42.6 54	44.2 57
44	RA DEC	12 47 -59 38	12.0 12	13.7 19	14.8 28	15.4 38	15.5 47	15.0 54	14.3 56	13.4 54	12.6 48	12.5 41	13.0 34	14.2 30	16.0 32
45	RA DEC	12 53 -55 59	39.1 66	40.6 64	41.7 67	42.2 74	42.1 82	41.5 89	40.8 92	39.9 90	39.2 84	39.0 75	39.3 64	40.1 54	41.5 47
46	RA DEC	13 23 -54 57	34.5 55	36.0 52	37.1 54	37.7 61	37.8 69	37.3 77	36.6 80	35.7 80	35.0 75	34.6 67	34.7 56	35.4 45	36.7 37
47	RA DEC	13 24 -11 06	43.7 57	44.8 63	45.5 68	46.0 71	46.2 73	46.2 72	46.0 71	45.6 69	45.3 67	45.2 66	45.4 67	46.0 70	47.0 75
48	RA DEC	13 47 -49 20	11.6 66	12.9 61	14.0 62	14.6 68	14.8 76	14.6 84	14.0 88	13.2 89	12.5 86	12.1 78	12.1 68	12.7 58	13.8 49
49	RA DEC	14 03 -60 19	10.9 39	12.7 43	14.2 49	15.3 58	15.8 67	15.8 74	15.3 79	14.4 80	13.5 76	12.9 70	13.0 62	14.0 57	15.6 55

Table 10a.(4). Apparent Places of Stars, 1991 (Degrees)—Continued

Star No.	Right ascen- sion Declination (°')	(Hr Min)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
50	RA DEC	14 06 36 19	09.3 31	10.6 36	11.5 42	12.2 48	12.6 53	12.7 58	12.5 60	12.1 59	11.6 56	11.3 52	11.4 48	12.0 46	13.1 48
51	RA DEC	14 15 19 13	15.4 30	16.4 23	17.3 21	17.9 22	18.2 27	18.2 31	18.0 35	17.6 38	17.1 37	16.8 34	16.9 28	17.3 20	18.1 12
52	RA DEC	14 38 60 47	58.8 47	60.6 49	62.1 54	63.4 62	64.1 70	64.3 78	63.9 84	63.0 85	62.0 83	61.2 77	61.1 70	61.8 64	63.3 61
53	RA DEC	14 50 16 00	22.9 21	24.0 26	24.9 30	25.6 33	26.1 35	26.3 35	26.3 35	25.9 33	25.5 32	25.2 30	25.2 30	25.6 31	26.4 34
54	RA DEC	14 50 74 10	41.3 68	43.8 63	46.2 63	48.1 70	48.8 79	48.2 88	46.7 95	44.4 97	42.0 94	40.0 87	39.0 76	39.2 65	40.7 55
55	RA DEC	15 34 26 44	18.2 26	19.2 19	20.1 16	20.9 18	21.5 23	21.7 30	21.6 36	21.2 40	20.7 41	20.2 39	19.9 33	20.1 25	20.7 16
56	RA DEC	15 59 22 35	47.9 50	48.9 53	49.9 56	50.8 59	51.5 60	51.9 61	52.1 62	51.8 62	51.4 61	50.9 59	50.7 58	50.9 57	51.6 58
57	RA DEC	16 28 26 24	51.0 48	52.0 50	53.0 52	54.0 54	54.8 55	55.4 57	55.6 58	55.4 58	54.9 58	54.4 56	54.1 54	54.3 53	54.9 53
58	RA DEC	16 47 69 00	40.8 41	42.9 37	45.1 36	47.4 39	49.3 44	50.6 52	51.0 59	50.4 65	49.0 68	47.6 66	46.5 60	46.4 52	47.5 45
59	RA DEC	17 09 15 42	51.3 55	52.1 57	53.0 59	54.0 60	54.8 59	55.4 58	55.7 57	55.6 56	55.3 55	54.8 55	54.4 54	54.4 55	54.9 56
60	RA DEC	17 32 37 05	59.4 55	60.3 53	61.4 53	62.5 54	63.5 55	64.4 57	64.8 59	64.8 61	64.3 63	63.8 62	63.3 60	63.2 57	63.6 54
61	RA DEC	17 34 12 33	30.5 51	31.2 44	32.0 41	32.9 41	33.7 44	34.3 50	34.6 56	34.6 61	34.2 64	33.6 65	33.2 62	33.1 58	33.4 51
62	RA DEC	17 56 51 28	22.1 75	22.7 65	23.7 60	25.0 59	26.1 64	26.9 73	27.1 83	26.8 92	26.0 98	25.0 99	24.0 96	23.4 88	23.5 78
63	RA DEC	18 23 34 23	34.1 26	34.9 24	35.8 23	36.9 22	37.9 21	38.9 22	39.5 23	39.6 25	39.3 27	38.7 27	38.2 26	37.9 24	38.2 22
64	RA DEC	18 36 38 46	36.9 26	37.4 16	38.1 11	39.1 09	40.1 13	41.0 21	41.4 31	41.4 40	40.9 46	40.2 49	39.4 47	39.0 41	39.0 32
65	RA DEC	18 54 26 18	42.1 35	42.7 34	43.5 33	44.5 31	45.5 29	46.4 28	47.0 27	47.3 28	47.0 29	46.6 29	46.0 30	45.8 29	45.9 27
66	RA DEC	19 50 08 50	20.2 38	20.5 33	21.1 30	21.9 29	22.8 32	23.7 38	24.3 45	24.6 51	24.6 55	24.2 57	23.7 57	23.3 55	23.2 50
67	RA DEC	20 24 56 45	55.9 61	56.2 53	57.0 46	58.3 40	59.8 35	61.4 34	62.7 36	63.4 41	63.3 47	62.7 52	61.8 54	60.9 52	60.6 46
68	RA DEC	20 41 45 14	06.3 60	06.3 51	06.7 44	07.5 39	08.7 40	09.8 45	10.7 54	11.1 65	11.0 75	10.5 81	09.7 84	09.0 82	08.5 76
69	RA DEC	21 40 77 25	28.8 62	28.2 53	28.9 43	30.9 33	33.8 25	37.4 22	40.5 24	42.7 30	43.2 38	42.1 46	39.7 50	37.0 50	34.9 44
70	RA DEC	22 07 46 59	40.3 87	40.2 82	40.4 75	41.1 67	42.1 60	43.4 54	44.6 52	45.5 53	46.0 58	45.8 63	45.3 68	44.6 70	44.1 68
71	RA DEC	22 42 30 10	34.7 39	34.5 34	34.5 28	34.9 24	35.7 23	36.7 27	37.7 33	38.5 42	38.9 50	39.0 57	38.6 61	38.2 62	37.8 59
72	RA DEC	22 57 29 39	09.8 78	09.6 76	09.6 72	10.0 66	10.7 59	11.7 52	12.8 47	13.7 45	14.2 46	14.3 50	14.0 54	13.5 57	13.1 57
73	RA DEC	23 04 15 09	19.0 33	18.8 29	18.8 26	19.1 24	19.8 25	20.7 29	21.7 36	22.5 43	23.0 49	23.1 54	22.9 56	22.5 56	22.2 54

Table 10a.(5). Apparent Places of Stars, 1992 (Degrees)—Continued

Star No.	Right ascension Declination (^o)	(Hr Min)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
50	RA DEC	14 06 -36 19	13.1 48	14.3 52	15.3 58	16.1 65	16.4 70	16.5 74	16.3 76	15.8 75	15.3 72	15.0 68	15.1 64	15.7 62	16.8 64
51	RA DEC	14 15 19 12	18.1 72	19.2 66	20.0 63	20.7 65	20.9 69	20.9 74	20.7 78	20.3 80	19.9 80	19.5 77	19.6 71	20.0 63	20.9 55
52	RA DEC	14 39 -60 48	03.3 01	05.1 03	06.7 08	08.0 16	08.7 24	08.8 31	08.4 37	07.5 39	06.4 36	05.7 30	05.6 23	06.3 17	07.7 14
53	RA DEC	14 50 -16 00	26.4 34	27.5 39	28.4 43	29.1 47	29.6 48	29.8 48	29.7 48	29.4 46	28.9 45	28.6 43	28.6 42	29.0 44	29.8 47
54	RA DEC	14 50 74 10	40.7 55	43.2 49	45.6 50	47.5 56	48.2 66	47.5 75	45.9 82	43.7 84	41.3 81	39.3 74	38.3 63	38.5 52	40.1 42
55	RA DEC	15 34 26 44	20.7 16	21.7 09	22.7 06	23.5 08	24.0 13	24.2 20	24.2 27	23.8 31	23.2 32	22.7 29	22.4 23	22.6 15	23.3 06
56	RA DEC	15 59 -22 35	51.6 58	52.6 61	53.6 64	54.5 67	55.2 68	55.6 69	55.7 69	55.5 69	55.0 68	54.5 67	54.3 65	54.5 65	55.2 66
57	RA DEC	16 28 -26 24	54.9 53	55.9 55	56.9 57	57.9 59	58.6 61	59.2 62	59.4 63	59.2 63	58.7 63	58.2 61	57.9 59	58.0 58	58.6 58
58	RA DEC	16 47 -69 00	47.5 45	49.6 40	51.9 40	54.2 43	56.1 48	57.3 55	57.7 63	57.0 69	55.6 71	54.1 69	53.1 63	53.1 55	54.2 48
59	RA DEC	17 09 -15 42	54.9 56	55.7 59	56.6 61	57.6 62	58.3 61	59.0 60	59.3 58	59.2 58	58.8 57	58.3 56	57.9 56	57.9 56	58.3 58
60	RA DEC	17 33 -37 05	03.6 54	04.6 53	05.6 53	06.8 53	07.8 54	08.6 56	09.0 58	09.0 61	08.5 62	07.9 62	07.4 59	07.3 56	07.7 54
61	RA DEC	17 34 12 33	33.4 51	34.1 45	34.9 41	35.8 41	36.6 45	37.2 51	37.5 57	37.4 61	37.0 65	36.4 65	36.0 63	35.9 58	36.2 52
62	RA DEC	17 56 51 29	23.5 18	24.2 08	25.2 02	26.5 02	27.5 07	28.3 16	28.5 26	28.2 35	27.4 41	26.3 42	25.4 39	24.8 31	24.9 20
63	RA DEC	18 23 -34 23	38.2 22	39.0 19	39.9 18	41.0 17	42.0 16	42.9 17	43.5 18	43.7 20	43.3 22	42.7 22	42.2 21	41.9 19	42.2 17
64	RA DEC	18 36 38 46	39.0 32	39.5 23	40.3 17	41.3 16	42.3 20	43.1 28	43.5 37	43.5 46	43.0 53	42.2 55	41.5 53	41.0 47	41.0 38
65	RA DEC	18 54 -26 18	45.9 27	46.5 26	47.3 25	48.3 23	49.3 22	50.2 20	50.8 19	51.1 20	50.8 21	50.3 22	49.8 22	49.5 21	49.6 20
66	RA DEC	19 50 08 50	23.2 50	23.6 46	24.1 43	24.9 42	25.8 45	26.7 51	27.4 57	27.7 63	27.5 68	27.1 70	26.6 70	26.3 67	26.2 63
67	RA DEC	20 25 -56 45	0 .6 46	0 .9 39	01.8 31	03.0 25	04.5 21	06.1 20	07.3 22	08.0 27	07.9 33	07.3 37	06.3 39	05.5 37	05.1 32
68	RA DEC	20 41 45 14	08.5 76	08.5 67	09.0 59	09.8 55	10.9 55	12.1 61	12.9 70	13.4 81	13.2 90	12.7 97	11.9 100	11.2 97	10.7 91
69	RA DEC	21 40 -77 25	34.9 44	34.2 34	34.9 24	37.0 14	39.9 07	43.3 04	46.5 05	48.6 11	49.1 20	47.9 28	45.5 32	42.8 32	40.6 26
70	RA DEC	22 07 -46 59	44.1 68	43.9 62	44.1 55	44.8 47	45.8 40	47.0 34	48.3 32	49.2 34	49.6 38	49.4 44	48.9 49	48.2 50	47.6 49
71	RA DEC	22 42 30 10	37.8 59	37.5 54	37.5 49	37.9 44	38.7 43	39.7 47	40.7 54	41.5 62	41.9 71	41.9 77	41.6 82	41.1 82	40.7 79
72	RA DEC	22 57 -29 39	13.1 57	12.9 55	13.0 51	13.3 45	14.0 38	15.0 31	16.1 27	17.0 25	17.4 26	17.5 29	17.2 34	16.8 37	16.3 37
73	RA DEC	23 04 15 09	22.2 54	22.0 50	22.0 47	22.3 45	22.9 46	23.8 50	24.8 57	25.6 64	26.1 70	26.2 74	25.9 76	25.6 76	25.2 74

Table 10b.(1). Apparent Places of Stars, 1988 (Mils of Declination)

Star No.	Right ascension Declination	(Hr Min) MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH											
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
			Seconds (time of RA or arc of declination)											
1	RA DEC	00 07 515	45.5 1.03	45.1 1.01	44.9 1.00	45.0 .98	45.6 .97	46.5 .98	47.6 1.00	48.6 1.04	49.3 1.08	49.6 1.11	49.6 1.13	49.4 1.15
2	RA DEC	00 08 1050	30.8 .46	29.9 .44	29.3 .41	29.4 .37	30.2 .34	31.6 .34	33.2 .35	34.6 .39	35.6 .44	36.1 .49	35.9 .54	35.3 .56
3	RA DEC	00 25 -1374	10.5 .71	08.0 .68	06.6 .63	06.2 .58	07.3 .52	09.6 .47	12.7 .45	15.9 .45	18.3 .47	19.2 .52	18.4 .56	16.4 .59
4	RA DEC	00 25 -753	42.1 .33	41.6 .32	41.3 .29	41.3 .25	41.8 .21	42.7 .17	43.9 .13	45.1 .12	45.9 .13	46.3 .15	46.3 .19	45.9 .21
5	RA DEC	00 39 1003	48.5 1.03	47.7 1.02	47.1 .99	47.0 .95	47.6 .93	48.9 .91	50.4 .93	51.8 .96	52.9 1.00	53.5 1.05	53.6 1.10	53.1 1.13
6	RA DEC	00 42 -320	59.5 .96	59.2 .96	59.0 .95	59.0 .93	59.4 .90	60.1 .86	61.1 .83	62.1 .80	62.9 .80	63.3 .80	63.4 .82	63.2 .84
7	RA DEC	00 55 1078	58.0 .36	57.0 .35	56.2 .32	56.0 .28	56.6 .25	57.9 .23	59.5 .24	61.2 .27	62.4 .31	63.2 .36	63.3 .41	62.9 .44
8	RA DEC	01 24 1069	61.2 .85	60.2 .84	59.4 .82	59.0 .78	59.4 .75	60.6 .73	62.2 .73	63.9 .76	65.3 .80	66.2 .84	66.6 .89	66.3 .93
9	RA DEC	01 37 -1018	17.7 .69	16.7 .69	16.0 .66	15.5 .61	15.6 .56	16.3 .51	17.6 .47	19.1 .45	20.4 .45	21.2 .48	21.4 .53	21.0 .57
10	SEE TABLE 11. APPARENT PLACES OF POLARIS, 1988													
11	RA DEC	02 06 416	30.1 .16	29.8 .16	29.4 .15	29.1 .13	29.3 .13	29.9 .13	30.9 .15	31.9 .17	32.9 .20	33.6 .22	34.0 .24	34.1 .25
12	RA DEC	02 57 -717	49.8 .41	49.2 .42	48.6 .41	48.0 .39	47.9 .34	48.2 .29	49.0 .25	50.1 .21	51.1 .20	52.0 .22	52.5 .25	52.6 .29
13	RA DEC	03 01 71	39.9 .91	39.6 .90	39.2 .90	38.9 .90	38.9 .91	39.3 .92	40.1 .95	41.0 .98	41.9 1.00	42.7 1.00	43.2 1.00	43.5 1.00
14	RA DEC	03 23 885	28.8 .76	28.3 .77	27.6 .77	26.9 .75	26.8 .72	27.3 .70	28.4 .69	29.7 .70	31.1 .71	32.3 .74	33.2 .77	33.7 .81
15	RA DEC	04 35 293	15.1 .13	15.0 .13	14.6 .12	14.1 .12	13.8 .12	14.0 .12	14.6 .13	15.5 .15	16.4 .16	17.4 .17	18.2 .17	18.7 .17
16	RA DEC	05 13 -145	59.0 1.01	58.9 1.03	58.5 1.04	58.0 1.04	57.6 1.03	57.6 1.01	58.1 .98	58.8 .95	59.6 .94	60.5 .93	61.4 .95	62.0 .97
17	RA DEC	05 15 817	49.9 .60	49.8 .62	49.3 .63	48.5 .63	48.0 .61	48.1 .59	48.7 .58	49.8 .57	51.0 .56	52.3 .57	53.6 .58	54.4 .60
18	RA DEC	05 24 112	30.6 .74	30.6 .73	30.2 .73	29.7 .73	29.3 .73	29.3 .74	29.8 .76	30.5 .77	31.4 .79	32.3 .79	33.2 .78	33.8 .77
19	RA DEC	05 25 508	33.5 .46	33.5 .47	33.1 .47	32.5 .47	32.1 .46	32.2 .45	32.7 .45	33.5 .45	34.5 .45	35.5 .46	36.6 .46	37.3 .47
20	RA DEC	05 35 21	37.6 .46	37.6 .48	37.3 .48	36.7 .48	36.4 .48	36.3 .46	36.7 .44	37.4 .42	38.2 .40	39.1 .40	40.0 .41	40.7 .43
21	RA DEC	05 40 34	10.6 .61	10.5 .62	10.2 .63	09.7 .63	09.3 .62	09.2 .61	09.6 .59	10.3 .56	11.1 .55	12.0 .54	12.9 .55	13.6 .57
22	RA DEC	05 54 131	32.8 .69	32.8 .68	32.5 .67	32.0 .67	31.6 .68	31.5 .69	31.9 .70	32.5 .72	33.4 .73	34.3 .73	35.2 .72	35.9 .71
23	RA DEC	06 23 936	43.4 .66	43.2 .71	42.4 .74	41.3 .75	40.3 .73	39.7 .70	39.7 .65	40.2 .60	41.2 .56	42.4 .56	43.6 .58	44.5 .62
24	RA DEC	06 37 291	02.7 .77	02.9 .77	02.6 .77	02.1 .77	01.7 .77	01.5 .77	01.8 .77	02.4 .78	03.2 .78	04.1 .78	05.1 .77	06.0 .76
25	RA DEC	06 44 296	38.7 .84	38.8 .87	38.5 .89	37.9 .90	37.4 .89	37.2 .87	37.3 .84	37.8 .81	38.5 .79	39.3 .79	40.3 .80	41.1 .83

Table 10b.(1). Apparent Places of Stars, 1988 (Mils of Declination)—Continued

Star No.	Right Ascension Declination	(Hr Min) MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH											
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
			Seconds (time of RA or arc of declination)											
26	RA DEC	06 58 - 514	10.8 .72	10.9 .77	10.6 .79	09.9 .80	09.3 .80	09.0 .77	09.0 .74	09.4 .70	10.1 .67	11.0 .66	12.0 .67	12.9 .71
27	RA DEC	07 07 - 468	55.7 .82	55.8 .87	55.5 .89	54.9 .90	54.3 .90	54.0 .87	54.0 .84	54.4 .80	55.1 .78	56.0 .77	57.0 .79	57.8 .81
28	RA DEC	07 33 567	51.9 .40	52.3 .41	52.2 .42	51.7 .43	51.1 .44	50.8 .43	50.9 .42	51.4 .41	52.1 .39	53.1 .38	54.3 .37	55.3 .36
29	RA DEC	07 38 93	41.9 .48	42.2 .46	42.1 .45	41.7 .45	41.2 .45	40.9 .46	41.0 .47	41.4 .48	42.0 .49	42.8 .48	43.8 .47	44.7 .45
30	RA DEC	07 44 498	36.7 .79	37.1 .79	37.0 .80	36.5 .81	36.0 .81	35.7 .81	35.8 .80	36.2 .80	36.9 .78	37.8 .77	38.9 .75	39.9 .74
31	RA DEC	08 09 - 840	11.4 .84	11.7 .90	11.4 .94	10.6 .97	09.8 .98	09.1 .96	08.7 .93	08.8 .88	09.3 .84	10.3 .82	11.5 .82	12.6 .86
32	RA DEC	08 22 -1057	18.1 .19	18.4 .24	17.9 .29	16.9 .33	15.7 .34	14.6 .32	14.0 .29	13.8 .24	14.4 .20	15.5 .18	17.0 .18	18.4 .20
33	RA DEC	09 07 - 771	34.4 .20	35.0 .26	35.0 .30	34.5 .34	33.8 .35	33.1 .34	32.7 .32	32.6 .28	32.9 .24	33.7 .21	34.7 .21	35.9 .24
34	RA DEC	09 13 -1238	06.4 .45	07.2 .51	06.8 .57	05.5 .61	03.8 .63	02.1 .63	0 .8 .61	0 .1 .57	0 .3 .52	01.5 .49	03.5 .47	05.6 .49
35	RA DEC	09 27 - 152	0 .9 .97	01.5 1.01	01.7 1.03	01.4 1.04	01.0 1.04	0 .7 1.04	0 .5 1.02	0 .6 1.01	0 .8 .99	01.4 .99	02.3 1.00	03.3 1.03
36	RA DEC	10 07 213	45.1 .79	45.8 .77	46.2 .77	46.1 .77	45.7 .78	45.4 .79	45.2 .79	45.1 .79	45.3 .79	45.8 .77	46.6 .75	47.6 .72
37	RA DEC	11 01 1003	09.3 .43	10.7 .43	11.4 .46	11.4 .50	10.8 .53	10.0 .54	09.3 .54	08.9 .51	08.8 .47	09.2 .42	10.2 .37	11.6 .34
38	RA DEC	11 03 1098	01.9 .87	03.5 .88	04.3 .91	04.3 .95	03.6 .98	02.6 1.00	01.7 .99	01.1 .96	01.0 .91	01.4 .86	02.6 .81	04.2 .78
39	RA DEC	11 48 260	27.4 .22	28.4 .20	29.0 .19	29.2 .19	29.1 .21	28.8 .22	28.5 .23	28.3 .23	28.2 .22	28.4 .20	28.9 .17	29.8 .14
40	RA DEC	11 53 955	13.5 .67	14.9 .67	15.8 .69	16.0 .73	15.7 .76	15.0 .78	14.4 .79	13.8 .77	13.4 .73	13.6 .69	14.3 .63	15.4 .59
41	RA DEC	12 15 - 310	11.3 .65	12.3 .69	13.0 .72	13.2 .75	13.2 .76	13.0 .76	12.8 .76	12.5 .75	12.3 .73	12.3 .72	12.8 .72	13.7 .74
42	RA DEC	12 25 -1120	54.6 .50	56.4 .54	57.5 .58	58.0 .64	57.9 .68	57.2 .72	56.3 .73	55.3 .72	54.5 .68	54.4 .65	55.2 .61	56.6 .60
43	RA DEC	12 30 -1014	29.0 .08	30.5 .12	31.5 .16	32.0 .21	31.9 .26	31.5 .29	30.8 .30	30.0 .29	29.4 .25	29.3 .22	29.9 .19	31.2 .18
44	RA DEC	12 46 -1059	59.9 .90	61.6 .93	62.7 .98	63.3 1.02	63.3 1.07	62.9 1.10	62.2 1.12	61.2 1.11	60.5 1.08	60.3 1.04	60.9 1.01	62.2 1.00
45	RA DEC	12 53 995	30.9 .90	32.5 .89	33.6 .90	34.2 .94	34.1 .98	33.5 1.00	32.8 1.02	32.0 1.01	31.3 .98	31.1 .94	31.4 .88	32.4 .83
46	RA DEC	13 23 977	27.0 .46	28.5 .44	29.7 .45	30.3 .48	30.4 .53	30.0 .56	29.3 .58	28.5 .57	27.7 .55	27.3 .51	27.5 .45	28.3 .40
47	RA DEC	13 24 - 197	33.2 .32	34.3 .35	35.1 .38	35.6 .39	35.8 .40	35.8 .40	35.6 .40	35.3 .39	35.0 .38	34.9 .37	35.1 .38	35.8 .39
48	RA DEC	13 47 877	04.1 .64	05.5 .62	06.6 .62	07.3 .65	07.5 .69	07.2 .73	06.7 .75	06.0 .75	05.3 .73	04.9 .69	05.0 .64	05.6 .59
49	RA DEC	14 02 -1072	56.4 .22	58.3 .24	59.8 .27	60.8 .32	61.4 .36	61.4 .40	60.9 .42	60.0 .43	59.0 .41	58.5 .38	58.7 .35	59.6 .32

Table 10b.(1). Apparent Places of Stars, 1988 (Mils of Declination)—Continued

Star No.	Right ascension Declination	(Hr Min) MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH											
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
			Seconds (time of RA or arc of declination)											
50	RA DEC	14 05 - 645	57.5 .51	58.7 .54	59.7 .57	60.5 .60	60.8 .62	60.9 .64	60.8 .65	60.3 .65	59.8 .64	59.5 .62	59.7 .60	60.4 .60
51	RA DEC	14 15 341	06.4 1.06	07.5 1.03	08.4 1.02	09.0 1.02	09.3 1.04	09.4 1.07	09.2 1.08	08.8 1.09	08.4 1.09	08.1 1.07	08.2 1.04	08.6 1.00
52	RA DEC	14 38 -1080	44.7 .60	46.6 .61	48.2 .64	49.4 .68	50.1 .72	50.3 .76	49.9 .79	49.1 .80	48.0 .79	47.3 .76	47.2 .72	47.9 .70
53	RA DEC	14 50 - 284	11.9 .32	13.0 .35	14.0 .37	14.7 .39	15.2 .40	15.4 .40	15.4 .40	15.1 .39	14.7 .39	14.3 .38	14.4 .38	14.8 .39
54	RA DEC	14 50 1318	42.5 1.08	45.1 1.05	47.5 1.05	49.5 1.08	50.2 1.13	49.6 1.18	48.0 1.20	45.8 1.21	43.4 1.20	41.5 1.16	40.5 1.11	40.7 1.05
55	RA DEC	15 34 475	09.9 .57	10.9 .53	11.9 .51	12.7 .52	13.3 .55	13.5 .58	13.5 .61	13.1 .62	12.6 .63	12.1 .61	11.9 .59	12.1 .55
56	RA DEC	15 59 - 401	36.1 .59	37.2 .60	38.2 .62	39.1 .63	39.8 .64	40.3 .64	40.4 .65	40.2 .65	39.8 .64	39.3 .64	39.2 .63	39.4 .63
57	RA DEC	16 28 - 469	38.9 .46	39.9 .47	40.9 .49	41.9 .50	42.7 .51	43.3 .51	43.5 .52	43.4 .52	42.9 .52	42.4 .52	42.2 .51	42.3 .50
58	RA DEC	16 47 -1226	19.6 .79	21.7 .77	24.0 .77	26.4 .78	28.2 .81	29.5 .85	29.9 .88	29.3 .92	28.0 .93	26.5 .92	25.6 .89	25.6 .85
59	RA DEC	17 09 - 279	40.0 .33	40.8 .34	41.8 .36	42.7 .36	43.5 .36	44.2 .35	44.5 .35	44.5 .35	44.1 .34	43.6 .34	43.3 .34	43.3 .34
60	RA DEC	17 32 - 659	46.0 .51	46.9 .51	48.0 .51	49.2 .51	50.2 .52	51.1 .53	51.5 .54	51.5 .56	51.1 .56	50.5 .56	50.1 .55	50.0 .54
61	RA DEC	17 34 223	21.3 .38	22.1 .35	22.9 .33	23.8 .32	24.6 .34	25.3 .37	25.6 .40	25.5 .42	25.1 .44	24.6 .44	24.2 .43	24.1 .40
62	RA DEC	17 56 915	17.5 .32	18.2 .27	19.2 .24	20.5 .23	21.6 .26	22.3 .30	22.6 .35	22.3 .40	21.4 .42	20.4 .43	19.5 .41	19.0 .37
63	RA DEC	18 23 - 611	21.0 .44	21.8 .43	22.8 .43	23.9 .42	25.0 .42	25.9 .42	26.6 .43	26.7 .44	26.4 .45	25.9 .46	25.4 .45	25.2 .44
64	RA DEC	18 36 689	30.1 .23	30.7 .19	31.5 .16	32.5 .15	33.5 .17	34.3 .21	34.8 .25	34.7 .30	34.3 .33	33.6 .34	32.8 .33	32.4 .30
65	RA DEC	18 54 - 467	29.9 .83	30.6 .82	31.4 .82	32.4 .81	33.4 .80	34.4 .79	35.0 .79	35.3 .80	35.1 .80	34.6 .81	34.1 .81	33.9 .80
66	RA DEC	19 50 157	10.6 .05	10.9 .02	11.5 .01	12.3 0.00	13.2 .02	14.1 .05	14.8 .08	15.2 .11	15.1 .13	14.7 .14	14.2 .14	13.9 .13
67	RA DEC	20 24 -1009	40.6 .40	41.0 .36	41.9 .32	43.2 .29	44.8 .27	46.4 .27	47.7 .28	48.4 .30	48.4 .33	47.8 .36	46.9 .37	46.2 .36
68	RA DEC	20 40 804	59.4 .22	59.4 .17	59.8 .14	60.7 .11	61.8 .11	62.9 .14	63.8 .19	64.2 .24	64.1 .29	63.6 .32	62.8 .33	62.1 .32
69	RA DEC	21 40 -1376	08.5 .88	07.9 .83	08.8 .78	11.0 .73	14.0 .70	17.5 .68	20.8 .69	23.1 .72	23.6 .76	22.5 .80	20.2 .82	17.6 .82
70	RA DEC	22 07 835	28.3 .99	28.2 .96	28.5 .93	29.1 .88	30.2 .85	31.5 .82	32.8 .81	33.8 .82	34.2 .84	34.1 .87	33.5 .89	32.9 .90
71	RA DEC	22 42 536	25.3 .17	25.1 .15	25.1 .12	25.5 .10	26.3 .10	27.3 .11	28.4 .15	29.2 .19	29.6 .23	29.6 .27	29.3 .29	28.9 .29
72	RA DEC	22 56 - 527	59.1 .81	59.0 .80	59.0 .78	59.4 .75	60.1 .72	61.2 .68	62.3 .66	63.2 .65	63.7 .65	63.8 .67	63.6 .69	63.2 .70
73	RA DEC	23 04 269	09.1 .18	08.9 .16	08.9 .14	09.3 .13	09.9 .14	10.9 .16	11.9 .20	12.7 .23	13.2 .26	13.3 .28	13.1 .29	12.8 .29

Table 10b.(2). Apparent Places of Stars, 1989 (Mils of Declination)—Continued

Star No.	Right Ascension Declination MILS	(Hr Min)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH											
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
			Seconds (time of RA or arc of declination)											
50	RA DEC	14 06 - 645	01.4 .60	02.7 .63	03.7 .66	04.5 .69	04.8 .72	04.9 .74	04.7 .75	04.3 .75	03.8 .73	03.5 .71	03.6 .69	04.3 .68
51	RA DEC	14 15 341	09.5 .96	10.5 .93	11.4 .92	12.1 .93	12.4 .95	12.4 .97	12.2 .99	11.8 1.00	11.4 1.00	11.1 .98	11.1 .95	11.6 .91
52	RA DEC	14 38 -1080	49.4 .68	51.3 .69	52.8 .72	54.1 .76	54.8 .80	55.0 .83	54.6 .86	53.8 .87	52.7 .86	51.9 .83	51.8 .80	52.6 .77
53	RA DEC	14 50 - 284	15.7 .40	16.7 .42	17.6 .45	18.4 .46	18.9 .47	19.1 .47	19.1 .47	18.8 .47	18.4 .46	18.0 .45	18.0 .45	18.5 .46
54	RA DEC	14 50 1318	42.4 1.00	44.9 .97	47.2 .97	49.1 1.00	49.9 1.05	49.3 1.10	47.7 1.13	45.4 1.14	43.1 1.12	41.2 1.09	40.1 1.03	40.3 .97
55	RA DEC	15 34 475	12.7 .50	13.7 .47	14.7 .45	15.5 .46	16.1 .48	16.3 .52	16.3 .55	15.9 .57	15.4 .57	14.8 .56	14.6 .53	14.8 .49
56	RA DEC	15 59 - 401	40.1 .64	41.1 .65	42.1 .67	43.1 .68	43.8 .69	44.2 .70	44.4 .70	44.2 .70	43.7 .70	43.3 .69	43.0 .68	43.3 .68
57	RA DEC	16 28 - 469	43.0 .51	44.0 .51	45.0 .53	46.0 .54	46.8 .55	47.4 .55	47.6 .56	47.5 .56	47.0 .56	46.5 .55	46.2 .54	46.4 .54
58	RA DEC	16 47 -1226	26.7 .82	28.8 .80	31.0 .80	33.5 .81	35.4 .84	36.6 .88	37.0 .91	36.5 .94	35.1 .96	33.6 .95	32.6 .92	32.6 .88
59	RA DEC	17 09 - 279	43.8 .35	44.6 .37	45.5 .38	46.5 .38	47.4 .38	48.0 .37	48.3 .37	48.3 .36	47.9 .36	47.4 .36	47.0 .36	47.1 .36
60	RA DEC	17 32 - 659	50.5 .53	51.5 .52	52.5 .52	53.7 .52	54.8 .53	55.6 .54	56.0 .55	56.1 .56	55.6 .57	55.0 .57	54.5 .56	54.5 .54
61	RA DEC	17 34 223	24.4 .37	25.2 .34	26.0 .32	26.9 .32	27.7 .33	28.3 .36	28.7 .39	28.6 .42	28.2 .43	27.7 .43	27.2 .42	27.2 .40
62	RA DEC	17 56 915	19.0 .32	19.7 .27	20.7 .24	22.0 .24	23.1 .26	23.9 .31	24.1 .36	23.8 .40	23.0 .43	22.0 .43	21.0 .41	20.5 .38
63	RA DEC	18 23 - 611	25.5 .43	26.2 .42	27.2 .41	28.3 .41	29.4 .41	30.3 .41	30.9 .42	31.1 .43	30.8 .44	30.2 .44	29.7 .43	29.5 .42
64	RA DEC	18 36 689	32.4 .25	32.9 .21	33.7 .18	34.8 .18	35.8 .19	36.6 .23	37.0 .28	37.0 .32	36.5 .35	35.8 .36	35.1 .35	34.6 .33
65	RA DEC	18 54 - 467	34.1 .80	34.7 .79	35.5 .79	36.5 .78	37.5 .77	38.4 .76	39.1 .76	39.4 .76	39.2 .77	38.7 .77	38.2 .77	37.9 .77
66	RA DEC	19 50 157	13.8 .10	14.2 .08	14.7 .06	15.6 .06	16.5 .08	17.4 .10	18.0 .14	18.4 .17	18.3 .19	17.9 .20	17.4 .20	17.1 .19
67	RA DEC	20 24 -1009	45.8 .33	46.2 .29	47.0 .26	48.4 .22	50.0 .20	51.5 .20	52.8 .21	53.6 .23	53.6 .26	52.9 .29	52.0 .30	51.2 .29
68	RA DEC	20 41 804	01.6 .29	01.7 .25	02.1 .21	03.0 .19	04.1 .19	05.2 .22	06.1 .26	06.6 .32	06.4 .36	05.9 .40	05.1 .41	04.4 .40
69	RA DEC	21 40 -1376	15.6 .79	14.9 .74	15.7 .69	17.9 .64	21.0 .61	24.5 .59	27.7 .60	30.0 .63	30.6 .67	29.4 .71	27.0 .73	24.4 .73
70	RA DEC	22 07 835	32.4 .89	32.3 .86	32.5 .83	33.2 .79	34.3 .75	35.6 .72	36.8 .71	37.8 .72	38.3 .74	38.1 .77	37.6 .79	36.9 .80
71	RA DEC	22 42 536	28.4 .28	28.2 .25	28.3 .23	28.7 .21	29.4 .20	30.5 .22	31.5 .25	32.4 .30	32.8 .34	32.8 .37	32.4 .40	32.0 .40
72	RA DEC	22 57 - 527	02.8 .71	02.6 .70	02.6 .68	03.0 .64	03.8 .61	04.8 .58	05.8 .55	06.8 .54	07.3 .55	07.4 .57	07.1 .59	06.7 .60
73	RA DEC	23 04 269	12.4 .28	12.2 .26	12.2 .25	12.6 .24	13.3 .24	14.2 .27	15.2 .30	16.0 .34	16.5 .37	16.6 .39	16.4 .40	16.1 .40

Table 10b.(3). Apparent Places of Stars, 1990 (Mils of Declination)

Star No.	Right ascen- sion Declina- tion	(Hr Min) MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
1	RA DEC	00 07 516	52.4 .25	52.0 .23	51.8 .21	52.0 .19	52.5 .18	53.5 .19	54.5 .22	55.5 .25	56.2 .29	56.5 .33	56.5 .35	56.2 .36	55.9 .36
2	RA DEC	00 08 1050	38.1 .68	37.2 .66	36.7 .63	36.8 .59	37.6 .56	39.0 .55	40.5 .57	42.0 .60	43.1 .65	43.5 .70	43.3 .75	42.7 .78	41.9 .79
3	RA DEC	00 25 -1374	16.6 .48	14.0 .46	12.5 .42	12.1 .36	13.1 .30	15.4 .26	18.4 .23	21.5 .23	23.9 .26	24.8 .30	24.0 .35	21.9 .38	19.1 .38
4	RA DEC	00 25 - 752	48.5 1.12	47.9 1.11	47.6 1.09	47.6 1.05	48.1 1.00	49.0 .95	50.1 .92	51.3 .91	52.2 .92	52.6 .94	52.5 .98	52.1 1.01	51.5 1.02
5	RA DEC	00 39 1004	56.3 .25	55.4 .23	54.9 .20	54.8 .16	55.5 .14	56.7 .12	58.1 .13	59.6 .17	60.8 .21	61.3 .26	61.3 .31	61.0 .34	60.3 .35
6	RA DEC	00 43 - 320	06.2 .75	05.8 .75	05.5 .74	05.6 .72	05.9 .69	06.7 .65	07.6 .62	08.6 .60	09.4 .59	09.8 .59	09.8 .61	09.6 .63	09.3 .64
7	RA DEC	00 56 1078	06.3 .56	05.2 .55	04.5 .53	04.4 .49	04.9 .45	06.2 .44	07.8 .44	09.5 .47	10.8 .52	11.5 .57	11.7 .61	11.3 .65	10.5 .67
8	RA DEC	01 25 1069	10.1 1.05	09.1 1.04	08.3 1.02	08.0 .98	08.4 .95	09.6 .93	11.2 .93	12.9 .95	14.3 .99	15.2 1.04	15.5 1.08	15.3 1.12	14.7 1.14
9	RA DEC	01 37 -1018	22.4 .49	21.4 .49	20.6 .47	20.1 .42	20.2 .37	21.0 .32	22.2 .28	23.6 .26	24.9 .27	25.7 .30	25.9 .34	25.4 .38	24.6 .40
10	SEE TABLE 11. APPARENT PLACES OF POLARIS, 1990														
11	RA DEC	02 06 416	37.7 .34	37.3 .34	36.9 .32	36.7 .31	36.8 .30	37.4 .31	38.3 .32	39.4 .35	40.4 .38	41.1 .40	41.4 .41	41.5 .42	41.4 .42
12	RA DEC	02 57 - 717	54.8 .25	54.1 .27	53.5 .27	52.9 .24	52.8 .20	53.1 .15	53.8 .11	54.9 .08	56.0 .06	56.8 .08	57.3 .11	57.4 .16	57.1 .19
13	RA DEC	03 01 72	46.9 .05	46.5 .04	46.1 .04	45.8 .04	45.8 .04	46.2 .06	46.9 .09	47.9 .11	48.8 .13	49.6 .14	50.0 .14	50.3 .13	50.3 .12
14	RA DEC	03 23 885	38.4 .89	37.8 .90	37.1 .90	36.5 .88	36.4 .85	36.9 .83	37.9 .82	39.3 .82	40.7 .84	41.9 .86	42.7 .90	43.2 .93	43.2 .95
15	RA DEC	04 35 293	22.8 .20	22.6 .19	22.2 .19	21.7 .19	21.5 .18	21.6 .19	22.1 .20	23.0 .20	24.0 .22	24.9 .23	25.7 .23	26.2 .22	26.5 .22
16	RA DEC	05 14 - 145	05.4 .98	05.3 1.00	04.9 1.01	04.3 1.01	04.0 1.00	04.0 .98	04.3 .95	05.0 .93	05.9 .91	06.8 .91	07.6 .92	08.2 .95	08.5 .97
17	RA DEC	05 15 817	59.8 .63	59.6 .65	59.1 .66	58.3 .65	57.9 .63	57.9 .61	58.4 .60	59.5 .59	60.8 .58	62.0 .59	63.2 .60	64.1 .62	64.6 .64
18	RA DEC	05 24 112	37.7 .77	37.6 .75	37.3 .75	36.8 .74	36.4 .75	36.4 .76	36.8 .77	37.5 .79	38.4 .80	39.3 .80	40.1 .80	40.8 .79	41.2 .77
19	RA DEC	05 25 508	41.9 .48	41.8 .49	41.4 .49	40.9 .48	40.5 .48	40.5 .47	40.9 .47	41.8 .46	42.8 .47	43.8 .47	44.8 .48	45.5 .48	46.0 .48
20	RA DEC	05 35 - 21	44.4 .45	44.3 .46	43.9 .47	43.4 .48	43.1 .47	43.0 .45	43.4 .43	44.0 .41	44.9 .39	45.8 .39	46.6 .40	47.3 .42	47.7 .45
21	RA DEC	05 40 - 34	17.3 .60	17.2 .62	16.8 .63	16.3 .63	16.0 .62	15.9 .60	16.2 .58	16.9 .56	17.7 .55	18.6 .54	19.4 .55	20.1 .58	20.5 .60
22	RA DEC	05 54 131	40.0 .68	39.9 .67	39.6 .67	39.1 .66	38.7 .67	38.7 .68	39.0 .69	39.6 .70	40.5 .71	41.4 .72	42.2 .71	43.0 .69	43.4 .67
23	RA DEC	06 23 - 936	46.4 .69	46.1 .74	45.3 .77	44.3 .78	43.3 .77	42.7 .73	42.6 .69	43.1 .64	44.1 .60	45.3 .59	46.5 .61	47.4 .66	47.8 .71
24	RA DEC	06 37 291	10.4 .72	10.5 .72	10.2 .72	09.7 .72	09.3 .72	09.1 .72	09.3 .72	09.9 .73	10.7 .73	11.6 .73	12.6 .72	13.4 .71	14.1 .70
25	RA DEC	06 44 - 296	44.5 .90	44.6 .94	44.3 .96	43.7 .97	43.2 .96	43.0 .94	43.1 .91	43.5 .88	44.3 .86	45.1 .85	46.0 .87	46.8 .90	47.4 .94

Table 10b.(3). Apparent Places of Stars, 1990 (Mils of Declination)—Continued

Star No.	Right ascension Declination	(Hr Min) MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH											
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
			Seconds (time of RA or arc of declination)											
26	RA DEC	06 58 - 514	16.0 .79	16.1 .83	15.8 .85	15.1 .87	14.6 .86	14.2 .84	14.2 .80	14.6 .77	15.3 .74	16.2 .73	17.2 .74	18.0 .78
27	RA DEC	07 07 - 468	61.1 .90	61.2 .94	60.9 .97	60.3 .98	59.8 .98	59.4 .95	59.4 .92	59.8 .88	60.5 .86	61.3 .85	62.3 .86	63.1 .90
28	RA DEC	07 33 567	60.3 .31	60.7 .31	60.5 .32	60.0 .33	59.5 .33	59.2 .33	59.2 .32	59.7 .31	60.4 .29	61.4 .28	62.5 .26	63.5 .25
29	RA DEC	07 38 93	48.8 .36	49.1 .34	49.0 .33	48.6 .33	48.1 .33	47.8 .34	47.9 .35	48.2 .36	48.8 .37	49.6 .36	50.5 .35	51.4 .33
30	RA DEC	07 44 498	44.8 .68	45.1 .69	45.0 .69	44.6 .70	44.1 .70	43.7 .70	43.7 .69	44.1 .68	44.8 .67	45.7 .66	46.8 .64	47.8 .63
31	RA DEC	08 09 - 840	15.6 .97	15.8 1.03	15.5 1.07	14.8 1.10	14.0 1.11	13.2 1.09	12.9 1.06	13.0 1.01	13.5 .97	14.4 .95	15.6 .95	16.8 .99
32	RA DEC	08 22 -1057	20.9 .32	21.2 .38	20.8 .43	19.8 .47	18.6 .48	17.5 .46	16.8 .43	16.7 .39	17.3 .34	18.4 .31	19.9 .31	21.3 .34
33	RA DEC	09 07 - 771	39.4 .37	39.9 .42	39.9 .47	39.5 .51	38.8 .52	38.1 .51	37.7 .49	37.6 .45	37.9 .41	38.6 .39	39.7 .38	40.9 .41
34	RA DEC	09 13 -1238	08.2 .62	08.9 .68	08.6 .74	07.4 .78	05.7 .80	03.9 .80	02.6 .78	01.9 .74	02.2 .70	03.4 .66	05.3 .65	07.5 .66
35	RA DEC	09 27 - 153	07.4 .15	08.0 .19	08.2 .21	08.0 .22	07.6 .22	07.2 .21	07.0 .20	07.0 .19	07.3 .17	07.9 .17	08.7 .18	09.6 .20
36	RA DEC	10 07 213	52.1 .60	52.8 .58	53.1 .57	53.0 .57	52.7 .58	52.4 .59	52.1 .60	52.1 .60	52.3 .59	52.7 .58	53.5 .56	54.4 .53
37	RA DEC	11 01 1003	17.1 .21	18.4 .22	19.0 .25	19.0 .28	18.5 .31	17.6 .33	16.9 .32	16.4 .30	16.3 .25	16.7 .21	17.7 .16	19.0 .13
38	RA DEC	11 03 1098	09.8 .66	11.3 .67	12.1 .70	12.0 .74	11.4 .77	10.3 .78	09.4 .78	08.7 .75	08.6 .70	09.0 .65	10.1 .60	11.6 .57
39	RA DEC	11 48 259	34.2 1.00	35.1 .98	35.7 .97	35.9 .98	35.8 .99	35.5 1.00	35.2 1.01	34.9 1.01	34.8 1.00	35.0 .99	35.5 .96	36.3 .93
40	RA DEC	11 53 955	20.2 .45	21.6 .45	22.4 .47	22.7 .51	22.4 .54	21.7 .57	21.0 .57	20.3 .55	20.0 .52	20.1 .47	20.7 .42	21.9 .38
41	RA DEC	12 15 - 310	18.2 .87	19.2 .91	19.8 .94	20.1 .96	20.1 .97	19.9 .98	19.6 .97	19.3 .96	19.1 .94	19.2 .93	19.6 .93	20.4 .95
42	RA DEC	12 26 -1120	02.4 .72	04.1 .75	05.2 .80	05.8 .85	05.7 .90	05.0 .93	04.1 .94	03.1 .93	02.3 .90	02.2 .86	02.9 .82	04.4 .80
43	RA DEC	12 30 -1014	36.6 .30	38.1 .34	39.1 .38	39.7 .43	39.6 .47	39.1 .50	38.4 .51	37.6 .50	37.1 .47	36.9 .43	37.5 .40	38.8 .39
44	RA DEC	12 47 -1060	08.0 .11	09.6 .14	10.7 .18	11.4 .24	11.4 .28	11.0 .31	10.2 .33	09.3 .32	08.6 .29	08.4 .25	09.0 .22	10.2 .20
45	RA DEC	12 53 995	36.5 .68	38.0 .67	39.1 .69	39.6 .72	39.6 .76	39.0 .80	38.2 .81	37.4 .80	36.7 .77	36.5 .73	36.8 .67	37.7 .62
46	RA DEC	13 23 977	32.1 .26	33.6 .24	34.7 .25	35.4 .28	35.5 .32	35.0 .36	34.3 .38	33.4 .38	32.7 .35	32.3 .31	32.4 .26	33.1 .20
47	RA DEC	13 24 - 197	40.3 .52	41.3 .55	42.1 .58	42.6 .59	42.8 .60	42.8 .60	42.6 .59	42.3 .59	42.0 .58	41.8 .57	42.0 .57	42.7 .59
48	RA DEC	13 47 877	09.2 .45	10.5 .43	11.6 .43	12.3 .46	12.5 .50	12.2 .54	11.7 .56	10.9 .57	10.2 .55	09.8 .51	09.8 .46	10.4 .41
49	RA DEC	14 03 -1072	06.1 .40	07.9 .42	09.4 .45	10.5 .50	11.1 .54	11.0 .58	10.5 .60	09.7 .61	08.7 .59	08.2 .56	08.3 .52	09.2 .49

Table 10b.(3). Apparent Places of Stars, 1990 (Mils of Declination)—Continued

Star No.	Right ascension Declination	(Hr Min) MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH											
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
			Seconds (time of RA or arc of declination)											
50	RA DEC	14 06 - 645	05.4 .69	06.6 .72	07.6 .75	08.4 .78	08.8 .81	08.9 .83	08.6 .84	08.2 .84	07.7 .82	07.4 .80	07.5 .78	08.2 .77
51	RA DEC	14 15 341	12.5 .87	13.5 .84	14.4 .83	15.0 .83	15.3 .85	15.4 .88	15.1 .90	14.8 .91	14.3 .90	14.0 .89	14.0 .86	14.5 .82
52	RA DEC	14 38 -1080	54.1 .76	55.9 .77	57.5 .79	58.8 .83	59.6 .87	59.7 .91	59.3 .94	58.4 .94	57.4 .93	56.6 .91	56.5 .87	57.2 .84
53	RA DEC	14 50 - 284	19.3 .48	20.4 .50	21.3 .52	22.1 .54	22.6 .55	22.8 .55	22.7 .55	22.4 .54	22.0 .53	21.7 .53	21.6 .52	22.0 .53
54	RA DEC	14 50 1318	41.9 .92	44.4 .90	46.8 .90	48.7 .93	49.4 .98	48.8 1.02	47.2 1.05	45.0 1.07	42.6 1.05	40.7 1.01	39.6 .96	39.8 .90
55	RA DEC	15 34 475	15.5 .44	16.5 .41	17.4 .39	18.3 .40	18.8 .43	19.1 .46	19.0 .49	18.6 .51	18.1 .52	17.6 .50	17.3 .47	17.5 .43
56	RA DEC	15 59 - 401	44.1 .69	45.1 .70	46.0 .72	47.0 .73	47.7 .74	48.1 .74	48.2 .75	48.0 .74	47.6 .74	47.1 .73	46.9 .73	47.1 .72
57	RA DEC	16 28 - 469	47.1 .54	48.0 .55	49.0 .56	50.1 .57	50.9 .58	51.4 .59	51.6 .59	51.5 .59	51.0 .59	50.5 .59	50.2 .58	50.4 .57
58	RA DEC	16 47 -1226	33.8 .85	35.9 .82	38.1 .82	40.5 .83	42.5 .86	43.7 .90	44.0 .94	43.5 .97	42.2 .98	40.7 .97	39.6 .94	39.6 .90
59	RA DEC	17 09 - 279	47.6 .37	48.4 .38	49.3 .39	50.3 .40	51.1 .39	51.8 .39	52.1 .38	52.0 .38	51.6 .37	51.1 .37	50.8 .37	50.8 .37
60	RA DEC	17 32 - 659	55.0 .53	55.9 .52	57.0 .52	58.2 .52	59.2 .53	60.0 .54	60.5 .55	60.5 .56	60.1 .57	59.5 .57	58.9 .56	58.9 .54
61	RA DEC	17 34 223	27.5 .36	28.2 .33	29.0 .31	30.0 .31	30.8 .33	31.4 .36	31.7 .39	31.6 .41	31.2 .43	30.7 .43	30.2 .42	30.1 .39
62	RA DEC	17 56 915	20.6 .32	21.3 .27	22.3 .25	23.5 .24	24.6 .27	25.4 .31	25.6 .36	25.3 .41	24.5 .44	23.5 .44	22.5 .42	22.0 .39
63	RA DEC	18 23 - 611	29.8 .41	30.6 .40	31.5 .39	32.6 .39	33.7 .39	34.7 .39	35.2 .40	35.4 .41	35.1 .41	34.6 .42	34.0 .41	33.8 .40
64	RA DEC	18 36 689	34.7 .28	35.1 .23	35.9 .20	37.0 .20	38.0 .22	38.8 .26	39.2 .30	39.2 .35	38.7 .38	38.0 .39	37.3 .38	36.8 .35
65	RA DEC	18 54 - 467	38.1 .77	38.7 .76	39.5 .75	40.5 .74	41.6 .74	42.5 .73	43.1 .73	43.4 .73	43.2 .73	42.7 .74	42.1 .74	41.9 .73
66	RA DEC	19 50 157	17.1 .16	17.4 .14	17.9 .12	18.7 .12	19.7 .14	20.6 .17	21.2 .20	21.5 .22	21.5 .25	21.1 .26	20.6 .25	20.2 .24
67	RA DEC	20 24 -1009	51.0 .26	51.3 .22	52.1 .19	53.4 .16	55.0 .14	56.6 .13	57.8 .14	58.5 .17	58.5 .19	57.9 .21	56.9 .22	56.1 .21
68	RA DEC	20 41 804	04.0 .37	04.0 .32	04.4 .29	05.3 .26	06.4 .27	07.5 .30	08.4 .34	08.9 .39	08.8 .44	08.2 .47	07.4 .48	06.7 .47
69	RA DEC	21 40 -1376	22.4 .70	21.7 .65	22.5 .60	24.6 .55	27.6 .51	31.2 .50	34.3 .51	36.4 .53	37.1 .57	36.0 .61	33.5 .64	30.8 .64
70	RA DEC	22 07 - 835	36.5 .79	36.3 .76	36.5 .73	37.2 .69	38.3 .65	39.6 .62	40.8 .61	41.7 .62	42.2 .64	42.1 .67	41.5 .69	40.8 .70
71	RA DEC	22 42 536	31.6 .39	31.4 .36	31.4 .33	31.8 .31	32.6 .31	33.6 .33	34.6 .36	35.5 .40	35.9 .44	35.9 .48	35.6 .50	35.1 .50
72	RA DEC	22 57 - 527	06.4 .60	06.1 .59	06.2 .57	06.6 .54	07.3 .51	08.3 .47	09.4 .45	10.3 .44	10.8 .44	10.9 .46	10.6 .48	10.2 .50
73	RA DEC	23 04 269	15.8 .39	15.5 .37	15.5 .35	15.9 .35	16.6 .35	17.5 .37	18.5 .41	19.3 .44	19.8 .47	19.9 .50	19.7 .51	19.3 .51

Table 10b.(2). Apparent Places of Stars, 1989 (Mils of Declination)—Continued

Star No.	Right Ascension Declination		(Hr Min) MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH											
	JAN	FEB		MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	
	Seconds (time of RA or arc of declination)														
50	RA DEC	14 06 - 645	01.4 .60	02.7 .63	03.7 .66	04.5 .69	04.8 .72	04.9 .74	04.7 .75	04.3 .75	03.8 .73	03.5 .71	03.6 .69	04.3 .68	05.4 .69
51	RA DEC	14 15 341	09.5 .96	10.5 .93	11.4 .92	12.1 .93	12.4 .95	12.4 .97	12.2 .99	11.8 1.00	11.4 1.00	11.1 .98	11.1 .95	11.6 .91	12.5 .87
52	RA DEC	14 38 -1080	49.4 .68	51.3 .69	52.8 .72	54.1 .76	54.8 .80	55.0 .83	54.6 .86	53.8 .87	52.7 .86	51.9 .83	51.8 .80	52.6 .77	54.1 .76
53	RA DEC	14 50 - 284	15.7 .40	16.7 .42	17.6 .45	18.4 .46	18.9 .47	19.1 .47	19.1 .47	18.8 .47	18.4 .46	18.0 .45	18.0 .45	18.5 .46	19.3 .48
54	RA DEC	14 50 1318	42.4 1.00	44.9 .97	47.2 .97	49.1 1.00	49.9 1.05	49.3 1.10	47.7 1.13	45.4 1.14	43.1 1.12	41.2 1.09	40.1 1.03	40.3 .97	41.9 .92
55	RA DEC	15 34 475	12.7 .50	13.7 .47	14.7 .45	15.5 .46	16.1 .48	16.3 .52	16.3 .55	15.9 .57	15.4 .57	14.8 .56	14.6 .53	14.8 .49	15.5 .44
56	RA DEC	15 59 - 401	40.1 .64	41.1 .65	42.1 .67	43.1 .68	43.8 .69	44.2 .70	44.4 .70	44.2 .70	43.7 .70	43.3 .69	43.0 .68	43.3 .68	44.1 .69
57	RA DEC	16 28 - 469	43.0 .51	44.0 .51	45.0 .53	46.0 .54	46.8 .55	47.4 .55	47.6 .56	47.5 .56	47.0 .56	46.5 .55	46.2 .54	46.4 .54	47.1 .54
58	RA DEC	16 47 -1226	26.7 .82	28.8 .80	31.0 .80	33.5 .81	35.4 .84	36.6 .88	37.0 .91	36.5 .94	35.1 .96	33.6 .95	32.6 .92	32.6 .88	33.8 .85
59	RA DEC	17 09 - 279	43.8 .35	44.6 .37	45.5 .38	46.5 .38	47.4 .38	48.0 .37	48.3 .37	48.3 .36	47.9 .36	47.4 .36	47.0 .36	47.1 .36	47.6 .37
60	RA DEC	17 32 - 659	50.5 .53	51.5 .52	52.5 .52	53.7 .52	54.8 .53	55.6 .54	56.0 .55	56.1 .56	55.6 .57	55.0 .57	54.5 .56	54.5 .54	55.0 .53
61	RA DEC	17 34 223	24.4 .37	25.2 .34	26.0 .32	26.9 .32	27.7 .33	28.3 .36	28.7 .39	28.6 .42	28.2 .43	27.7 .43	27.2 .42	27.2 .40	27.5 .36
62	RA DEC	17 56 915	19.0 .32	19.7 .27	20.7 .24	22.0 .24	23.1 .26	23.9 .31	24.1 .36	23.8 .40	23.0 .43	22.0 .43	21.0 .41	20.5 .38	20.6 .32
63	RA DEC	18 23 - 611	25.5 .43	26.2 .42	27.2 .41	28.3 .41	29.4 .41	30.3 .41	30.9 .42	31.1 .43	30.8 .44	30.2 .44	29.7 .43	29.5 .42	29.8 .41
64	RA DEC	18 36 689	32.4 .25	32.9 .21	33.7 .18	34.8 .18	35.8 .19	36.6 .23	37.0 .28	37.0 .32	36.5 .35	35.8 .36	35.1 .35	34.6 .33	34.7 .28
65	RA DEC	18 54 - 467	34.1 .80	34.7 .79	35.5 .79	36.5 .78	37.5 .77	38.4 .76	39.1 .76	39.4 .76	39.2 .77	38.7 .77	38.2 .77	37.9 .77	38.1 .77
66	RA DEC	19 50 157	13.8 .10	14.2 .08	14.7 .06	15.6 .06	16.5 .08	17.4 .10	18.0 .14	18.4 .17	18.3 .19	17.9 .20	17.4 .20	17.1 .19	17.1 .16
67	RA DEC	20 24 -1009	45.8 .33	46.2 .29	47.0 .26	48.4 .22	50.0 .20	51.5 .20	52.8 .21	53.6 .23	53.6 .26	52.9 .29	52.0 .30	51.2 .29	51.0 .26
68	RA DEC	20 41 804	01.6 .29	01.7 .25	02.1 .21	03.0 .19	04.1 .19	05.2 .22	06.1 .26	06.6 .32	06.4 .36	05.9 .40	05.1 .41	04.4 .40	04.0 .37
69	RA DEC	21 40 -1376	15.6 .79	14.9 .74	15.7 .69	17.9 .64	21.0 .61	24.5 .59	27.7 .60	30.0 .63	30.6 .67	29.4 .71	27.0 .73	24.4 .73	22.4 .70
★70	RA DEC	21 43 174	38.0 .65	38.0 .63	38.3 .61	38.9 .61	39.7 .62	40.7 .65	41.6 .68	42.2 .72	42.5 .74	42.3 .76	41.9 .76	41.6 .76	41.3 .74
★71	RA DEC	22 07 - 835	32.4 .89	32.3 .86	32.5 .83	33.2 .79	34.3 .75	35.6 .72	36.8 .71	37.8 .72	38.3 .74	38.1 .77	37.6 .79	36.9 .80	36.5 .79
72	RA DEC	22 57 - 527	02.8 .71	02.6 .70	02.6 .68	03.0 .64	03.8 .61	04.8 .58	05.8 .55	06.8 .54	07.3 .55	07.4 .57	07.1 .59	06.7 .60	06.4 .60
73	RA DEC	23 04 269	12.4 .28	12.2 .26	12.2 .25	12.6 .24	13.3 .24	14.2 .27	15.2 .30	16.0 .34	16.5 .37	16.6 .39	16.4 .40	16.1 .40	15.8 .39

Table 10b.(3). Apparent Places of Stars, 1990 (Mils of Declination)

Star No.	Right ascension Declination	(Hr Min) MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH											
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
			Seconds (time of RA or arc of declination)											
1	RA DEC	00 07 516	52.4 .25	52.0 .23	51.8 .21	52.0 .19	52.5 .18	53.5 .19	54.5 .22	55.5 .25	56.2 .29	56.5 .33	56.5 .35	56.2 .36
2	RA DEC	00 08 1050	38.1 .68	37.2 .66	36.7 .63	36.8 .59	37.6 .56	39.0 .55	40.5 .57	42.0 .60	43.1 .65	43.5 .70	43.3 .75	42.7 .78
3	RA DEC	00 25 -1374	16.6 .48	14.0 .46	12.5 .42	12.1 .36	13.1 .30	15.4 .26	18.4 .23	21.5 .23	23.9 .26	24.8 .30	24.0 .35	21.9 .38
4	RA DEC	00 25 -752	48.5 1.12	47.9 1.11	47.6 1.09	47.6 1.05	48.1 1.00	49.0 .95	50.1 .92	51.3 .91	52.2 .92	52.6 .94	52.5 .98	52.1 1.01
5	RA DEC	00 39 1004	56.3 .25	55.4 .23	54.9 .20	54.8 .16	55.5 .14	56.7 .12	58.1 .13	59.6 .17	60.8 .21	61.3 .26	61.3 .31	61.0 .34
6	RA DEC	00 43 -320	06.2 .75	05.8 .75	05.5 .74	05.6 .72	05.9 .69	06.7 .65	07.6 .62	08.6 .60	09.4 .59	09.8 .59	09.8 .61	09.6 .63
7	RA DEC	00 56 1078	06.3 .56	05.2 .55	04.5 .53	04.4 .49	04.9 .45	06.2 .44	07.8 .44	09.5 .47	10.8 .52	11.5 .57	11.7 .61	11.3 .65
8	RA DEC	01 25 1069	10.1 1.05	09.1 1.04	08.3 1.02	08.0 .98	08.4 .95	09.6 .93	11.2 .93	12.9 .95	14.3 .99	15.2 1.04	15.5 1.08	15.3 1.12
9	RA DEC	01 37 -1018	22.4 .49	21.4 .49	20.6 .47	20.1 .42	20.2 .37	21.0 .32	22.2 .28	23.6 .26	24.9 .27	25.7 .30	25.9 .34	25.4 .38
10	SEE TABLE 11. APPARENT PLACES OF POLARIS, 1990													
11	RA DEC	02 06 416	37.7 .34	37.3 .34	36.9 .32	36.7 .31	36.8 .30	37.4 .31	38.3 .32	39.4 .35	40.4 .38	41.1 .40	41.4 .41	41.5 .42
12	RA DEC	02 57 -717	54.8 .25	54.1 .27	53.5 .27	52.9 .24	52.8 .20	53.1 .15	53.8 .11	54.9 .08	56.0 .06	56.8 .08	57.3 .11	57.4 .16
13	RA DEC	03 01 72	46.9 .05	46.5 .04	46.1 .04	45.8 .04	45.8 .04	46.2 .06	46.9 .09	47.9 .11	48.8 .13	49.6 .14	50.0 .14	50.3 .13
14	RA DEC	03 23 885	38.4 .89	37.8 .90	37.1 .90	36.5 .88	36.4 .85	36.9 .83	37.9 .82	39.3 .82	40.7 .84	41.9 .86	42.7 .90	43.2 .93
15	RA DEC	04 35 293	22.8 .20	22.6 .19	22.2 .19	21.7 .19	21.5 .18	21.6 .19	22.1 .20	23.0 .20	24.0 .22	24.9 .23	25.7 .23	26.2 .22
16	RA DEC	05 14 -145	05.4 .98	05.3 1.00	04.9 1.01	04.3 1.01	04.0 1.00	04.0 .98	04.3 .95	05.0 .93	05.9 .91	06.8 .91	07.6 .92	08.2 .95
17	RA DEC	05 15 817	59.8 .63	59.6 .65	59.1 .66	58.3 .65	57.9 .63	57.9 .61	58.4 .60	59.5 .59	60.8 .58	62.0 .59	63.2 .60	64.1 .62
18	RA DEC	05 24 112	37.7 .77	37.6 .75	37.3 .75	36.8 .74	36.4 .75	36.4 .76	36.8 .77	37.5 .79	38.4 .80	39.3 .80	40.1 .80	40.8 .79
19	RA DEC	05 25 508	41.9 .48	41.8 .49	41.4 .49	40.9 .48	40.5 .48	40.5 .47	40.9 .47	41.8 .46	42.8 .47	43.8 .47	44.8 .48	45.5 .48
20	RA DEC	05 35 -21	44.4 .45	44.3 .46	43.9 .47	43.4 .48	43.1 .47	43.0 .45	43.4 .43	44.0 .41	44.9 .39	45.8 .39	46.6 .40	47.3 .42
21	RA DEC	05 40 -34	17.3 .60	17.2 .62	16.8 .63	16.3 .63	16.0 .62	15.9 .60	16.2 .58	16.9 .56	17.7 .55	18.6 .54	19.4 .55	20.1 .58
22	RA DEC	05 54 131	40.0 .68	39.9 .67	39.6 .67	39.1 .66	38.7 .67	38.7 .68	39.0 .69	39.6 .70	40.5 .71	41.4 .72	42.2 .71	43.0 .69
23	RA DEC	06 23 -936	46.4 .69	46.1 .74	45.3 .77	44.3 .78	43.3 .77	42.7 .73	42.6 .69	43.1 .64	44.1 .60	45.3 .59	46.5 .61	47.4 .66
24	RA DEC	06 37 291	10.4 .72	10.5 .72	10.2 .72	09.7 .72	09.3 .72	09.1 .72	09.3 .72	09.9 .73	10.7 .73	11.6 .73	12.6 .72	13.4 .71
25	RA DEC	06 44 -296	44.5 .90	44.6 .94	44.3 .96	43.7 .97	43.2 .96	43.0 .94	43.1 .91	43.5 .88	44.3 .86	45.1 .85	46.0 .87	46.8 .90

Table 10b.(3). Apparent Places of Stars, 1990 (Mils of Declination)—Continued

Star No.	Right ascension Declination	(Hr Min) MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH											
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
			Seconds (time of RA or arc of declination)											
26	RA DEC	06 58 - 514	16.0 .79	16.1 .83	15.8 .85	15.1 .87	14.6 .86	14.2 .84	14.2 .80	14.6 .77	15.3 .74	16.2 .73	17.2 .74	18.0 .78
27	RA DEC	07 07 - 468	61.1 .90	61.2 .94	60.9 .97	60.3 .98	59.8 .98	59.4 .95	59.4 .92	59.8 .88	60.5 .86	61.3 .85	62.3 .86	63.1 .90
28	RA DEC	07 33 567	60.3 .31	60.7 .31	60.5 .32	60.0 .33	59.5 .33	59.2 .33	59.2 .32	59.7 .31	60.4 .29	61.4 .28	62.5 .26	63.5 .25
29	RA DEC	07 38 93	48.8 .36	49.1 .34	49.0 .33	48.6 .33	48.1 .33	47.8 .34	47.9 .35	48.2 .36	48.8 .37	49.6 .36	50.5 .35	51.4 .33
30	RA DEC	07 44 498	44.8 .68	45.1 .69	45.0 .69	44.6 .70	44.1 .70	43.7 .70	43.7 .69	44.1 .68	44.8 .67	45.7 .66	46.8 .64	47.8 .63
31	RA DEC	08 09 - 840	15.6 .97	15.8 1.03	15.5 1.07	14.8 1.10	14.0 1.11	13.2 1.09	12.9 1.06	13.0 1.01	13.5 .97	14.4 .95	15.6 .95	16.8 .99
32	RA DEC	08 22 -1057	20.9 .32	21.2 .38	20.8 .43	19.8 .47	18.6 .48	17.5 .46	16.8 .43	16.7 .39	17.3 .34	18.4 .31	19.9 .31	21.3 .34
33	RA DEC	09 07 - 771	39.4 .37	39.9 .42	39.9 .47	39.5 .51	38.8 .52	38.1 .51	37.7 .49	37.6 .45	37.9 .41	38.6 .39	39.7 .38	40.9 .41
34	RA DEC	09 13 -1238	08.2 .62	08.9 .68	08.6 .74	07.4 .78	05.7 .80	03.9 .80	02.6 .78	01.9 .74	02.2 .70	03.4 .66	05.3 .65	07.5 .66
35	RA DEC	09 27 - 153	07.4 .15	08.0 .19	08.2 .21	08.0 .22	07.6 .22	07.2 .21	07.0 .20	07.0 .19	07.3 .17	07.9 .17	08.7 .18	09.6 .20
36	RA DEC	10 07 213	52.1 .60	52.8 .58	53.1 .57	53.0 .57	52.7 .58	52.4 .59	52.1 .60	52.1 .60	52.3 .59	52.7 .58	53.5 .56	54.4 .53
37	RA DEC	11 01 1003	17.1 .21	18.4 .22	19.0 .25	19.0 .28	18.5 .31	17.6 .33	16.9 .32	16.4 .30	16.3 .25	16.7 .21	17.7 .16	19.0 .13
38	RA DEC	11 03 1098	09.8 .66	11.3 .67	12.1 .70	12.0 .74	11.4 .77	10.3 .78	09.4 .78	08.7 .75	08.6 .70	09.0 .65	10.1 .60	11.6 .57
39	RA DEC	11 48 259	34.2 1.00	35.1 .98	35.7 .97	35.9 .98	35.8 .99	35.5 1.00	35.2 1.01	34.9 1.01	34.8 1.00	35.0 .99	35.5 .96	36.3 .93
40	RA DEC	11 53 955	20.2 .45	21.6 .45	22.4 .47	22.7 .51	22.4 .54	21.7 .57	21.0 .57	20.3 .55	20.0 .52	20.1 .47	20.7 .42	21.9 .38
41	RA DEC	12 15 - 310	18.2 .87	19.2 .91	19.8 .94	20.1 .96	20.1 .97	19.9 .98	19.6 .97	19.3 .96	19.1 .94	19.2 .93	19.6 .93	20.4 .95
42	RA DEC	12 26 -1120	02.4 .72	04.1 .75	05.2 .80	05.8 .85	05.7 .90	05.0 .93	04.1 .94	03.1 .93	02.3 .90	02.2 .86	02.9 .82	04.4 .80
43	RA DEC	12 30 -1014	36.6 .30	38.1 .34	39.1 .38	39.7 .43	39.6 .47	39.1 .50	38.4 .51	37.6 .50	37.1 .47	36.9 .43	37.5 .40	38.8 .39
44	RA DEC	12 47 -1060	08.0 .11	09.6 .14	10.7 .18	11.4 .24	11.4 .28	11.0 .31	10.2 .33	09.3 .32	08.6 .29	08.4 .25	09.0 .22	10.2 .20
45	RA DEC	12 53 995	36.5 .68	38.0 .67	39.1 .69	39.6 .72	39.6 .76	39.0 .80	38.2 .81	37.4 .80	36.7 .77	36.5 .73	36.8 .67	37.7 .62
46	RA DEC	13 23 977	32.1 .26	33.6 .24	34.7 .25	35.4 .28	35.5 .32	35.0 .36	34.3 .38	33.4 .38	32.7 .35	32.3 .31	32.4 .26	33.1 .20
47	RA DEC	13 24 - 197	40.3 .52	41.3 .55	42.1 .58	42.6 .59	42.8 .60	42.8 .60	42.6 .59	42.3 .59	42.0 .58	41.8 .57	42.0 .57	42.7 .59
48	RA DEC	13 47 877	09.2 .45	10.5 .43	11.6 .43	12.3 .46	12.5 .50	12.2 .54	11.7 .56	10.9 .57	10.2 .55	09.8 .51	09.8 .46	10.4 .41
49	RA DEC	14 03 -1072	06.1 .40	07.9 .42	09.4 .45	10.5 .50	11.1 .54	11.0 .58	10.5 .60	09.7 .61	08.7 .59	08.2 .56	08.3 .52	09.2 .49

Table 10b.(3). Apparent Places of Stars, 1990 (Mils of Declination)—Continued

Star No.	Right ascen- sion Declina- tion	(Hr Min) MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
50	RA DEC	14 06 - 645	05.4 .69	06.6 .72	07.6 .75	08.4 .78	08.8 .81	08.9 .83	08.6 .84	08.2 .84	07.7 .82	07.4 .80	07.5 .78	08.2 .77	09.3 .78
51	RA DEC	14 15 341	12.5 .87	13.5 .84	14.4 .83	15.0 .83	15.3 .85	15.4 .88	15.1 .90	14.8 .91	14.3 .90	14.0 .89	14.0 .86	14.5 .82	15.4 .78
52	RA DEC	14 38 -1080	54.1 .76	55.9 .77	57.5 .79	58.8 .83	59.6 .87	59.7 .91	59.3 .94	58.4 .94	57.4 .93	56.6 .91	56.5 .87	57.2 .84	58.8 .82
53	RA DEC	14 50 - 284	19.3 .48	20.4 .50	21.3 .52	22.1 .54	22.6 .55	22.8 .55	22.7 .55	22.4 .54	22.0 .53	21.7 .53	21.6 .52	22.0 .53	22.9 .55
54	RA DEC	14 50 1318	41.9 .92	44.4 .90	46.8 .90	48.7 .93	49.4 .98	48.8 1.02	47.2 1.05	45.0 1.07	42.6 1.05	40.7 1.01	39.6 .96	39.8 .90	41.3 .85
55	RA DEC	15 34 475	15.5 .44	16.5 .41	17.4 .39	18.3 .40	18.8 .43	19.1 .46	19.0 .49	18.6 .51	18.1 .52	17.6 .50	17.3 .47	17.5 .43	18.2 .39
56	RA DEC	15 59 - 401	44.1 .69	45.1 .70	46.0 .72	47.0 .73	47.7 .74	48.1 .74	48.2 .75	48.0 .74	47.6 .74	47.1 .73	46.9 .73	47.1 .72	47.9 .73
57	RA DEC	16 28 - 469	47.1 .54	48.0 .55	49.0 .56	50.1 .57	50.9 .58	51.4 .59	51.6 .59	51.5 .59	51.0 .59	50.5 .59	50.2 .58	50.4 .57	51.0 .57
58	RA DEC	16 47 -1226	33.8 .85	35.9 .82	38.1 .82	40.5 .83	42.5 .86	43.7 .90	44.0 .94	43.5 .97	42.2 .98	40.7 .97	39.6 .94	39.6 .90	40.8 .87
59	RA DEC	17 09 - 279	47.6 .37	48.4 .38	49.3 .39	50.3 .40	51.1 .39	51.8 .39	52.1 .38	52.0 .38	51.6 .37	51.1 .37	50.8 .37	50.8 .37	51.3 .38
60	RA DEC	17 32 - 659	55.0 .53	55.9 .52	57.0 .52	58.2 .52	59.2 .53	60.0 .54	60.5 .55	60.5 .56	60.1 .57	59.5 .57	58.9 .56	58.9 .54	59.4 .53
61	RA DEC	17 34 223	27.5 .36	28.2 .33	29.0 .31	30.0 .31	30.8 .33	31.4 .36	31.7 .39	31.6 .41	31.2 .43	30.7 .43	30.2 .42	30.1 .39	30.5 .36
62	RA DEC	17 56 915	20.6 .32	21.3 .27	22.3 .25	23.5 .24	24.6 .27	25.4 .31	25.6 .36	25.3 .41	24.5 .44	23.5 .44	22.5 .42	22.0 .39	22.1 .33
63	RA DEC	18 23 - 611	29.8 .41	30.6 .40	31.5 .39	32.6 .39	33.7 .39	34.7 .39	35.2 .40	35.4 .41	35.1 .41	34.6 .42	34.0 .41	33.8 .40	34.1 .39
64	RA DEC	18 36 689	34.7 .28	35.1 .23	35.9 .20	37.0 .20	38.0 .22	38.8 .26	39.2 .30	39.2 .35	38.7 .38	38.0 .39	37.3 .38	36.8 .35	36.9 .31
65	RA DEC	18 54 - 467	38.1 .77	38.7 .76	39.5 .75	40.5 .74	41.6 .74	42.5 .73	43.1 .73	43.4 .73	43.2 .73	42.7 .74	42.1 .74	41.9 .73	42.1 .73
66	RA DEC	19 50 157	17.1 .16	17.4 .14	17.9 .12	18.7 .12	19.7 .14	20.6 .17	21.2 .20	21.5 .22	21.5 .25	21.1 .26	20.6 .25	20.2 .24	20.2 .22
67	RA DEC	20 24 -1009	51.0 .26	51.3 .22	52.1 .19	53.4 .16	55.0 .14	56.6 .13	57.8 .14	58.5 .17	58.5 .19	57.9 .21	56.9 .22	56.1 .21	55.9 .19
68	RA DEC	20 41 804	04.0 .37	04.0 .32	04.4 .29	05.3 .26	06.4 .27	07.5 .30	08.4 .34	08.9 .39	08.8 .44	08.2 .47	07.4 .48	06.7 .47	06.3 .44
69	RA DEC	21 40 -1376	22.4 .70	21.7 .65	22.5 .60	24.6 .55	27.6 .51	31.2 .50	34.3 .51	36.4 .53	37.1 .57	36.0 .61	33.5 .64	30.8 .64	28.8 .60
★70	RA DEC	21 43 174	41.3 .74	41.3 .72	41.5 .71	42.1 .71	42.9 .72	43.9 .75	44.8 .78	45.4 .81	45.7 .84	45.5 .85	45.1 .85	44.7 .85	44.5 .84
★71	RA DEC	22 07 - 835	36.5 .79	36.3 .76	36.5 .73	37.2 .69	38.3 .65	39.6 .62	40.8 .61	41.7 .62	42.2 .64	42.1 .67	41.5 .69	40.8 .70	40.3 .69
72	RA DEC	22 57 - 527	06.4 .60	06.1 .59	06.2 .57	06.6 .54	07.3 .51	08.3 .47	09.4 .45	10.3 .44	10.8 .44	10.9 .46	10.6 .48	10.2 .50	09.8 .50
73	RA DEC	23 04 269	15.8 .39	15.5 .37	15.5 .35	15.9 .35	16.6 .35	17.5 .37	18.5 .41	19.3 .44	19.8 .47	19.9 .50	19.7 .51	19.3 .51	19.0 .50

Table 10b.(4). Apparent Places of Stars, 1991 (Mils of Declination)—Continued

Star No.	Right ascension Declination MILS	(Hr Min)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
50	RA DEC	14 06 - 645	09.3 .78	10.6 .81	11.5 .84	12.2 .87	12.6 .89	12.7 .92	12.5 .93	12.1 .92	11.6 .91	11.3 .89	11.4 .87	12.0 .86	13.1 .87
51	RA DEC	14 15 341	15.4 .78	16.4 .74	17.3 .73	17.9 .74	18.2 .76	18.2 .78	18.0 .80	17.6 .82	17.1 .81	16.8 .80	16.9 .77	17.3 .73	18.1 .69
52	RA DEC	14 38 -1080	58.8 .82	60.6 .83	62.1 .86	63.4 .90	64.1 .94	64.3 .98	63.9 1.01	63.0 1.01	62.0 1.00	61.2 .97	61.1 .94	61.8 .91	63.3 .89
53	RA DEC	14 50 - 284	22.9 .55	24.0 .57	24.9 .59	25.6 .61	26.1 .62	26.3 .62	26.3 .62	25.9 .61	25.5 .60	25.2 .59	25.2 .59	25.6 .60	26.4 .61
54	RA DEC	14 50 1318	41.3 .85	43.8 .83	46.2 .83	48.1 .86	48.8 .91	48.2 .95	46.7 .99	44.4 1.00	42.0 .98	40.0 .95	39.0 .89	39.2 .84	40.7 .79
55	RA DEC	15 34 475	18.2 .39	19.2 .35	20.1 .34	20.9 .35	21.5 .37	21.7 .41	21.6 .44	21.2 .46	20.7 .46	20.2 .45	19.9 .42	20.1 .38	20.7 .34
56	RA DEC	15 59 - 401	47.9 .73	48.9 .74	49.9 .76	50.8 .77	51.5 .78	51.9 .78	52.1 .79	51.8 .79	51.4 .78	50.9 .77	50.7 .77	50.9 .76	51.6 .77
57	RA DEC	16 28 - 469	51.0 .57	52.0 .58	53.0 .59	54.0 .60	54.8 .60	55.4 .61	55.6 .62	55.4 .62	54.9 .62	54.4 .61	54.1 .60	54.3 .60	54.9 .60
58	RA DEC	16 47 -1226	40.8 .87	42.9 .85	45.1 .84	47.4 .86	49.3 .88	50.6 .92	51.0 .96	50.4 .99	49.0 1.00	47.6 .99	46.5 .96	46.4 .92	47.5 .89
59	RA DEC	17 09 - 279	51.3 .38	52.1 .39	53.0 .40	54.0 .41	54.8 .40	55.4 .40	55.7 .39	55.6 .39	55.3 .38	54.8 .38	54.4 .38	54.4 .38	54.9 .39
60	RA DEC	17 32 - 659	59.4 .53	60.3 .52	61.4 .52	62.5 .53	63.5 .53	64.4 .54	64.8 .55	64.8 .56	64.3 .57	63.8 .57	63.3 .56	63.2 .54	63.6 .53
61	RA DEC	17 34 223	30.5 .36	31.2 .33	32.0 .31	32.9 .31	33.7 .33	34.3 .36	34.6 .39	34.6 .41	34.2 .43	33.6 .43	33.2 .42	33.1 .40	33.4 .36
62	RA DEC	17 56 915	22.1 .33	22.7 .28	23.7 .26	25.0 .25	26.1 .28	26.9 .32	27.1 .37	26.8 .42	26.0 .45	25.0 .45	24.0 .44	23.4 .40	23.5 .35
63	RA DEC	18 23 - 611	34.1 .39	34.9 .38	35.8 .37	36.9 .37	37.9 .36	38.9 .37	39.5 .37	39.6 .38	39.3 .39	38.7 .39	38.2 .39	37.9 .38	38.2 .37
64	RA DEC	18 36 689	36.9 .31	37.4 .26	38.1 .24	39.1 .23	40.1 .25	41.0 .29	41.4 .34	41.4 .38	40.9 .41	40.2 .43	39.4 .42	39.0 .39	39.0 .34
65	RA DEC	18 54 - 467	42.1 .73	42.7 .72	43.5 .72	44.5 .71	45.5 .70	46.4 .69	47.0 .69	47.3 .69	47.0 .70	46.6 .70	46.0 .70	45.8 .70	45.9 .69
66	RA DEC	19 50 157	20.2 .22	20.5 .20	21.1 .19	21.9 .18	22.8 .20	23.7 .22	24.3 .26	24.6 .29	24.6 .31	24.2 .32	23.7 .32	23.3 .31	23.2 .28
67	RA DEC	20 24 -1009	55.9 .19	56.2 .15	57.0 .12	58.3 .09	59.8 .06	61.4 .06	62.7 .07	63.4 .09	63.3 .12	62.7 .15	61.8 .16	60.9 .15	60.6 .12
68	RA DEC	20 41 804	06.3 .44	06.3 .40	06.7 .37	07.5 .34	08.7 .35	09.8 .37	10.7 .41	11.1 .47	11.0 .52	10.5 .55	09.7 .56	09.0 .55	08.5 .52
69	RA DEC	21 40 -1376	28.8 .60	28.2 .56	28.9 .51	30.9 .46	33.8 .42	37.4 .40	40.5 .41	42.7 .44	43.2 .48	42.1 .52	39.7 .54	37.0 .54	34.9 .51
70	RA DEC	22 07 - 835	40.3 .69	40.2 .66	40.4 .63	41.1 .59	42.1 .56	43.4 .53	44.6 .52	45.5 .52	46.0 .55	45.8 .57	45.3 .60	44.6 .60	44.1 .60
71	RA DEC	22 42 536	34.7 .49	34.5 .46	34.5 .43	34.9 .41	35.7 .41	36.7 .43	37.7 .46	38.5 .50	38.9 .54	39.0 .58	38.6 .60	38.2 .60	37.8 .59
72	RA DEC	22 57 - 527	09.8 .50	09.6 .49	09.6 .47	10.0 .44	10.7 .40	11.7 .37	12.8 .34	13.7 .33	14.2 .34	14.3 .36	14.0 .38	13.5 .39	13.1 .39
73	RA DEC	23 04 269	19.0 .50	18.8 .48	18.8 .46	19.1 .45	19.8 .46	20.7 .48	21.7 .51	22.5 .55	23.0 .58	23.1 .60	22.9 .61	22.5 .61	22.2 .60

Table 10b.(5). Apparent Places of Stars, 1992 (Mils of Declination)

Star No.	Right ascen- sion Declination	(Hr Min) MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
1	RA DEC	00 07 516	59.2 .45	58.8 .44	58.6 .41	58.7 .40	59.2 .39	60.2 .40	61.2 .42	62.2 .45	62.9 .49	63.2 .52	63.1 .55	62.9 .56	62.4 .55
2	RA DEC	00 08 1050	45.5 .88	44.6 .87	44.1 .83	44.1 .79	44.9 .76	46.3 .76	47.9 .77	49.4 .80	50.4 .85	50.8 .90	50.6 .95	50.0 .98	49.1 .98
3	RA DEC	00 25 -1374	21.5 .28	18.9 .25	17.4 .21	17.0 .15	17.9 .10	20.1 .05	23.1 .02	26.3 .03	28.6 .05	29.4 .10	28.6 .14	26.5 .17	23.6 .18
4	RA DEC	00 25 -752	54.4 .92	53.9 .91	53.5 .88	53.5 .84	54.0 .80	54.8 .76	56.0 .73	57.1 .71	57.9 .72	58.3 .75	58.2 .78	57.8 .81	57.2 .82
5	RA DEC	00 40 1004	04.1 .44	03.3 .43	02.7 .40	02.6 .37	03.1 .34	04.4 .32	05.9 .33	07.3 .37	08.4 .41	09.0 .45	09.0 .50	08.6 .53	07.8 .54
6	RA DEC	00 43 -320	12.4 .54	12.0 .55	11.8 .54	11.8 .52	12.1 .49	12.8 .45	13.8 .42	14.8 .40	15.5 .39	15.9 .40	15.9 .41	15.7 .43	15.3 .45
7	RA DEC	00 56 1078	14.6 .76	13.6 .75	12.9 .72	12.6 .68	13.2 .65	14.5 .63	16.1 .64	17.8 .67	19.0 .71	19.8 .76	19.9 .80	19.5 .84	18.6 .85
8	RA DEC	01 25 1070	19.1 .23	18.1 .23	17.3 .20	16.9 .16	17.3 .13	18.5 .11	20.1 .11	21.7 .13	23.1 .17	24.0 .22	24.4 .26	24.1 .30	23.3 .32
9	RA DEC	01 37 -1018	26.7 .32	25.6 .31	24.8 .29	24.3 .24	24.4 .19	25.1 .14	26.3 .10	27.7 .08	29.0 .09	29.8 .12	29.9 .17	29.5 .21	28.6 .23
10	SEE TABLE 11. APPARENT PLACES OF POLARIS, 1992														
11	RA DEC	02 06 416	45.0 .50	44.6 .50	44.2 .48	43.9 .47	44.0 .46	44.6 .46	45.6 .48	46.6 .50	47.5 .53	48.2 .55	48.6 .57	48.7 .58	48.4 .58
12	RA DEC	02 57 -716	59.3 1.13	58.7 1.14	58.1 1.14	57.5 1.11	57.3 1.07	57.6 1.02	58.4 .98	59.4 .95	60.5 .94	61.3 .95	61.8 .99	61.8 1.03	61.5 1.07
13	RA DEC	03 01 72	53.5 .18	53.2 .17	52.8 .16	52.4 .16	52.4 .17	52.8 .19	53.5 .21	54.4 .24	55.3 .26	56.0 .26	56.6 .26	56.8 .25	56.7 .24
14	RA DEC	03 23 885	47.8 1.00	47.2 1.01	46.5 1.01	45.8 .99	45.7 .96	46.2 .94	47.2 .92	48.5 .93	49.9 .95	51.0 .97	51.9 1.00	52.3 1.03	52.2 1.05
15	RA DEC	04 35 293	30.1 .24	29.9 .24	29.5 .23	28.9 .23	28.7 .23	28.8 .23	29.4 .24	30.2 .25	31.2 .26	32.1 .27	32.9 .27	33.4 .27	33.6 .26
16	RA DEC	05 14 -145	11.5 .97	11.4 .99	10.9 1.00	10.4 1.00	10.0 .99	10.0 .97	10.4 .94	11.0 .91	11.9 .90	12.7 .89	13.6 .91	14.1 .93	14.4 .96
17	RA DEC	05 16 817	09.2 .64	09.1 .66	08.5 .67	07.7 .66	07.2 .64	07.2 .62	07.8 .60	08.8 .59	10.0 .59	11.3 .60	12.5 .60	13.3 .62	13.7 .64
18	RA DEC	05 24 112	44.5 .77	44.4 .76	44.1 .75	43.5 .75	43.1 .75	43.1 .76	43.5 .78	44.2 .80	45.1 .80	46.0 .81	46.8 .80	47.4 .79	47.7 .77
19	RA DEC	05 25 508	49.9 .48	49.9 .49	49.5 .49	48.8 .49	48.4 .48	48.4 .47	48.9 .47	49.7 .47	50.7 .47	51.7 .47	52.7 .47	53.4 .48	53.8 .48
20	RA DEC	05 35 -21	50.8 .45	50.8 .47	50.4 .48	49.8 .48	49.4 .47	49.4 .46	49.7 .44	50.4 .42	51.2 .40	52.1 .40	52.9 .41	53.5 .43	53.9 .45
21	RA DEC	05 40 -34	23.6 .61	23.6 .62	23.2 .63	22.7 .64	22.3 .63	22.2 .61	22.5 .59	23.2 .57	24.0 .56	24.9 .55	25.7 .57	26.4 .59	26.7 .61
22	RA DEC	05 54 131	46.8 .66	46.8 .65	46.5 .64	45.9 .64	45.5 .65	45.4 .65	45.7 .67	46.4 .68	47.2 .69	48.1 .69	49.0 .68	49.7 .67	50.1 .65
23	RA DEC	06 23 -936	49.2 .74	49.0 .79	48.2 .82	47.1 .82	46.1 .81	45.5 .78	45.4 .74	45.9 .69	46.9 .65	48.1 .65	49.3 .67	50.2 .71	50.6 .77
24	RA DEC	06 37 291	17.6 .66	17.8 .66	17.5 .66	17.0 .66	16.5 .66	16.3 .66	16.5 .66	17.1 .67	17.9 .67	18.8 .66	19.7 .66	20.6 .64	21.1 .63
25	RA DEC	06 44 -296	50.1 .98	50.2 1.02	49.9 1.04	49.3 1.04	48.8 1.04	48.5 1.02	48.6 .99	49.1 .96	49.7 .94	50.6 .93	51.5 .95	52.3 .98	52.8 1.02

Table 10b.(5). Apparent Places of Stars, 1992 (Mils of Declination)—Continued

Star No.	Right Ascension Declination	(Hr Min) MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
26	RA DEC	06 58 - 514	21.1 .86	21.1 .91	20.8 .93	20.1 .95	19.5 .94	19.1 .92	19.2 .88	19.6 .84	20.2 .81	21.1 .81	22.1 .82	22.9 .86	23.5 .90
27	RA DEC	07 08 - 468	06.3 .99	06.4 1.03	06.1 1.06	05.5 1.07	04.9 1.06	04.5 1.04	04.5 1.01	04.9 .97	05.6 .94	06.4 .94	07.4 .95	08.2 .98	08.8 1.03
28	RA DEC	07 34 567	08.3 .20	08.7 .20	08.5 .21	08.0 .22	07.4 .22	07.1 .22	07.1 .21	07.5 .20	08.3 .19	09.2 .17	10.3 .16	11.3 .15	12.1 .15
29	RA DEC	07 38 93	55.4 .24	55.8 .22	55.6 .21	55.1 .21	54.6 .21	54.4 .22	54.4 .23	54.7 .24	55.3 .25	56.1 .24	57.0 .23	57.9 .20	58.6 .18
30	RA DEC	07 44 498	52.4 .56	52.8 .57	52.7 .58	52.2 .58	51.6 .59	51.3 .58	51.3 .58	51.7 .57	52.3 .55	53.2 .54	54.3 .52	55.3 .51	56.1 .51
31	RA DEC	08 09 - 841	19.7 .11	19.9 .16	19.6 .20	18.9 .23	18.0 .24	17.3 .22	17.0 .19	17.0 .15	17.6 .11	18.5 .09	19.7 .09	20.8 .12	21.6 .17
32	RA DEC	08 22 -1057	23.9 .47	24.2 .53	23.7 .58	22.7 .60	21.5 .62	20.4 .60	19.8 .58	19.7 .53	20.2 .48	21.3 .46	22.8 .46	24.3 .49	25.3 .54
33	RA DEC	09 07 - 771	44.3 .54	44.9 .60	44.8 .64	44.3 .67	43.6 .69	43.0 .68	42.6 .66	42.5 .62	42.7 .58	43.5 .56	44.5 .55	45.7 .58	46.7 .62
34	RA DEC	09 13 -1238	10.2 .80	11.0 .85	10.7 .91	09.4 .95	07.7 .97	06.0 .97	04.7 .95	04.0 .91	04.3 .86	05.5 .83	07.5 .81	09.6 .83	11.7 .87
35	RA DEC	09 27 - 153	13.7 .33	14.3 .36	14.4 .39	14.2 .40	13.8 .40	13.4 .40	13.2 .38	13.2 .36	13.4 .35	14.0 .34	14.8 .36	15.8 .38	16.7 .42
36	RA DEC	10 07 213	58.8 .40	59.5 .38	59.8 .37	59.7 .38	59.3 .38	58.9 .39	58.7 .40	58.6 .40	58.8 .40	59.2 .38	60.0 .36	61.0 .33	61.9 .30
37	RA DEC	11 01 1002	24.1 1.00	25.4 1.01	26.1 1.04	26.0 1.08	25.4 1.11	24.5 1.12	23.8 1.12	23.3 1.09	23.2 1.05	23.5 1.00	24.5 .96	25.9 .92	27.4 .90
38	RA DEC	11 03 1098	16.9 .44	18.4 .45	19.2 .49	19.1 .53	18.3 .56	17.3 .57	16.3 .57	15.7 .54	15.5 .49	15.9 .44	16.9 .40	18.5 .36	20.3 .35
39	RA DEC	11 48 259	40.5 .79	41.5 .76	42.0 .76	42.2 .76	42.1 .78	41.8 .79	41.5 .80	41.2 .80	41.0 .80	41.2 .78	41.7 .75	42.5 .72	43.5 .69
40	RA DEC	11 53 955	26.3 .24	27.7 .24	28.6 .26	28.8 .30	28.4 .34	27.7 .36	27.0 .36	26.3 .35	26.0 .31	26.0 .26	26.7 .21	27.8 .17	29.3 .15
41	RA DEC	12 15 - 311	24.8 .08	25.8 .12	26.4 .15	26.7 .17	26.7 .18	26.4 .18	26.1 .18	25.8 .16	25.6 .15	25.7 .14	26.1 .13	26.9 .15	28.0 .18
42	RA DEC	12 26 -1120	10.2 .92	11.9 .96	13.1 1.00	13.6 1.06	13.4 1.10	12.8 1.13	11.8 1.14	10.8 1.13	10.0 1.10	09.9 1.06	10.7 1.02	12.1 1.01	14.0 1.02
43	RA DEC	12 30 -1014	44.2 .50	45.8 .54	46.8 .59	47.2 .64	47.2 .68	46.7 .71	46.0 .72	45.2 .70	44.5 .67	44.5 .63	45.1 .60	46.3 .59	47.9 .60
44	RA DEC	12 47 -1060	16.0 .31	17.7 .34	18.8 .39	19.4 .43	19.4 .48	19.0 .51	18.2 .52	17.3 .51	16.6 .48	16.4 .44	16.9 .41	18.2 .40	19.9 .40
45	RA DEC	12 53 995	41.5 .49	43.1 .48	44.1 .49	44.7 .53	44.5 .57	43.9 .60	43.1 .61	42.3 .61	41.6 .58	41.3 .54	41.6 .48	42.5 .43	43.9 .40
46	RA DEC	13 23 976	36.7 1.07	38.2 1.06	39.3 1.07	40.0 1.10	40.0 1.14	39.5 1.18	38.8 1.20	37.9 1.20	37.1 1.17	36.7 1.13	36.8 1.08	37.6 1.02	38.9 .98
47	RA DEC	13 24 - 197	47.0 .70	48.1 .74	48.8 .76	49.3 .78	49.5 .78	49.5 .78	49.2 .77	48.9 .76	48.5 .75	48.4 .75	48.7 .75	49.3 .77	50.3 .79
48	RA DEC	13 47 877	13.8 .28	15.1 .25	16.2 .26	16.9 .29	17.0 .33	16.7 .37	16.2 .39	15.4 .39	14.7 .38	14.3 .34	14.3 .29	14.9 .24	16.0 .20
49	RA DEC	14 03 -1072	15.6 .57	17.5 .59	18.9 .62	20.0 .66	20.5 .71	20.5 .74	20.0 .77	19.1 .77	18.1 .75	17.6 .72	17.7 .68	18.6 .66	20.2 .65

Table 10b.(5). Apparent Places of Stars, 1992 (Mils of Declination)—Continued

Star No.	Right ascension Declination	(Hr Min) MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
50	RA DEC	14 06 - 645	13.1 .87	14.3 .89	15.3 .92	16.1 .95	16.4 .98	16.5 1.00	16.3 1.00	15.8 1.00	15.3 .99	15.0 .97	15.1 .95	15.7 .94	16.8 .95
51	RA DEC	14 15 341	18.1 .69	19.2 .66	20.0 .64	20.7 .65	20.9 .67	20.9 .70	20.7 .72	20.3 .73	19.9 .73	19.5 .71	19.6 .68	20.0 .64	20.9 .60
52	RA DEC	14 39 -1080	03.3 .89	05.1 .90	06.7 .93	08.0 .97	08.7 1.01	08.8 1.04	08.4 1.07	07.5 1.08	06.4 1.07	05.7 1.04	05.6 1.00	06.3 .97	07.7 .96
53	RA DEC	14 50 - 284	26.4 .61	27.5 .64	28.4 .66	29.1 .68	29.6 .68	29.8 .68	29.7 .68	29.4 .67	28.9 .67	28.6 .66	28.6 .65	29.0 .66	29.8 .68
54	RA DEC	14 50 1318	40.7 .79	43.2 .76	45.6 .77	47.5 .80	48.2 .84	47.5 .89	45.9 .92	43.7 .93	41.3 .92	39.3 .88	38.3 .83	38.5 .78	40.1 .73
55	RA DEC	15 34 475	20.7 .34	21.7 .30	22.7 .29	23.5 .30	24.0 .32	24.2 .36	24.2 .39	23.8 .41	23.2 .42	22.7 .40	22.4 .37	22.6 .33	23.3 .29
56	RA DEC	15 59 - 401	51.6 .77	52.6 .78	53.6 .80	54.5 .81	55.2 .82	55.6 .82	55.7 .82	55.5 .82	55.0 .82	54.5 .81	54.3 .80	54.5 .80	55.2 .81
57	RA DEC	16 28 - 469	54.9 .60	55.9 .60	56.9 .61	57.9 .62	58.6 .63	59.2 .64	59.4 .64	59.2 .64	58.7 .64	58.2 .63	57.9 .62	58.0 .62	58.6 .62
58	RA DEC	16 47 -1226	47.5 .89	49.6 .86	51.9 .86	54.2 .88	56.1 .90	57.3 .94	57.7 .98	57.0 1.01	55.6 1.02	54.1 1.01	53.1 .98	53.1 .94	54.2 .90
59	RA DEC	17 09 - 279	54.9 .39	55.7 .40	56.6 .41	57.6 .42	58.3 .41	59.0 .41	59.3 .40	59.2 .40	58.8 .39	58.3 .39	57.9 .39	57.9 .39	58.3 .40
60	RA DEC	17 33 - 659	03.6 .53	04.6 .52	05.6 .52	06.8 .52	07.8 .53	08.6 .54	09.0 .55	09.0 .56	08.5 .57	07.9 .57	07.4 .55	07.3 .54	07.7 .53
61	RA DEC	17 34 223	33.4 .36	34.1 .33	34.9 .31	35.8 .31	36.6 .33	37.2 .36	37.5 .39	37.4 .41	37.0 .43	36.4 .43	36.0 .42	35.9 .40	36.2 .37
62	RA DEC	17 56 915	23.5 .35	24.2 .30	25.2 .27	26.5 .27	27.5 .29	28.3 .34	28.5 .39	28.2 .43	27.4 .46	26.3 .47	25.4 .45	24.8 .41	24.9 .36
63	RA DEC	18 23 - 611	38.2 .37	39.0 .35	39.9 .35	41.0 .34	42.0 .34	42.9 .34	43.5 .35	43.7 .36	43.3 .37	42.7 .37	42.2 .36	41.9 .35	42.2 .34
64	RA DEC	18 36 689	39.0 .34	39.5 .30	40.3 .27	41.3 .26	42.3 .28	43.1 .32	43.5 .37	43.5 .41	43.0 .45	42.2 .46	41.5 .45	41.0 .42	41.0 .37
65	RA DEC	18 54 - 467	45.9 .69	46.5 .68	47.3 .68	48.3 .67	49.3 .66	50.2 .65	50.8 .65	51.1 .65	50.8 .66	50.3 .66	49.8 .66	49.5 .66	49.6 .65
66	RA DEC	19 50 157	23.2 .28	23.6 .26	24.1 .25	24.9 .24	25.8 .26	26.7 .29	27.4 .32	27.7 .35	27.5 .37	27.1 .38	26.6 .38	26.3 .37	26.2 .35
67	RA DEC	20 25 -1008	0 .6 1.12	0 .9 1.08	01.8 1.04	03.0 1.01	04.5 .99	06.1 .99	07.3 1.00	08.0 1.02	07.9 1.05	07.3 1.07	06.3 1.08	05.5 1.07	05.1 1.05
68	RA DEC	20 41 804	08.5 .52	08.5 .48	09.0 .44	09.8 .42	10.9 .42	12.1 .45	12.9 .49	13.4 .55	13.2 .59	12.7 .63	11.9 .64	11.2 .63	10.7 .60
69	RA DEC	21 40 -1376	34.9 .51	34.2 .46	34.9 .41	37.0 .37	39.9 .33	43.3 .32	46.5 .32	48.6 .35	49.1 .40	47.9 .43	45.5 .45	42.8 .45	40.6 .42
70	RA DEC	22 07 - 835	44.1 .60	43.9 .57	44.1 .53	44.8 .49	45.8 .46	47.0 .43	48.3 .42	49.2 .43	49.6 .45	49.4 .48	48.9 .50	48.2 .51	47.6 .50
71	RA DEC	22 42 536	37.8 .59	37.5 .56	37.5 .54	37.9 .51	38.7 .51	39.7 .53	40.7 .56	41.5 .60	41.9 .65	41.9 .68	41.6 .70	41.1 .70	40.7 .69
72	RA DEC	22 57 - 527	13.1 .39	12.9 .38	13.0 .36	13.3 .33	14.0 .30	15.0 .26	16.1 .24	17.0 .23	17.4 .24	17.5 .25	17.2 .28	16.8 .29	16.3 .29
73	RA DEC	23 04 269	22.2 .60	22.0 .58	22.0 .57	22.3 .56	22.9 .56	23.8 .58	24.8 .61	25.6 .65	26.1 .68	26.2 .70	25.9 .71	25.6 .71	25.2 .70



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